WESTERN COALFIELDS LIMITED
Environment Department

Proposal No. **IA/MH/CMIN/107217/2019**
Project Name: **Expansion of New Majri UG to OC**

Information /Clarification on EDS raised on 06.07.2019

Sl.No	Particulars	Submission
1	Pls submit Pre-feasibility report (PFR) as per Ministry's guidelines 30th December, 2010. present PFR report is not as per ministry's guidelines	The Project Report (including Mining Plan with mine closure plan) for Expansion of New Majri UG to OC for the production capacity of 3.0 MTPA has been approved by WCL Board in its 311th meeting as communicated vide resolution no. WCL/BD/SECTT./BM-311/2019/539 dated 07.06.2019. The copy of the executive summary of approved Project Report/(including Mining Plan) based on which the Form - 1 for grant of ToR has been prepared, is enclosed herewith along with the copy of the Board Resolution dated 07.06.2019.

वेस्टर्न कोलफील्ड्स लिमिटेड
Western Coalfields Limited

बोर्ड सचिवालय
BOARD SECRETARIAT

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BOARD MATTER
CONFIDENTIAL

REF: WCL/BD/SECTT/BM-311/2019/539 DATE: 07.06.2019

Reproduced below is the relevant excerpt from the minutes of 311th meeting of the Board of Directors of WCL held on 25th May, 2019:

"ITEM NO.311/ C-13
SUB Approval of PR for Expansion of New Majri UG to OC (including mining plan), March 2019 of Majri Area.

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i) While deliberating on the subject, Shri Manoj Kumar, Director (Technical) OP apprised the salient features of the Project Report of Expansion of New Majri UG to OC mine including Mining Plan (March, 2019) as brought out in the agenda note. The Board, after deliberation, approved the following :

a. PR of Expansion of New Majri UG to OC Mine, including Mining Plan (March, 2019) for capacity of 3.00 MTY with total capital investment of Rs. 496.3829 Crores (including WDV of Rs. 94.1087 Crores) in partial hiring option at desired selling price of Rs. 2213.49 per te at 85% capacity to yield IRR of 12%.

b. Signing of amendments to existing agreement with MAHAGENCO for additional quantity of 1.87 MTY at desired selling price of Rs. 2213.49 per te at 85% capacity to yield IRR of 12%.

c. In case MAHAGENCO disagree for consent to additional quantity, Identification of other consumers agreeing to pay desired selling price through website publication.

d. Obtaining Environmental clearance for Expansion of New Majri UG to OC Mine for 3.75 MTPA.

ii) GM (P&P) to take necessary action in the matter."

7/6/19

COMPANY SECRETARY

GENERAL MANAGER (P&P)

CC: DIRECTOR (PERSONNEL)
DIRECTOR (FINANCE)
DIRECTOR (TECHNICAL) OP
DIRECTOR (TECHNICAL) P&P

BRIEF OF CHAPTERS

1.0 INTRODUCTION

1.1 BACKGROUND OF THE PROJECT REPORT

The existing New Majri UG to OC mine is conversion of New Majri underground Colliery into opencast mine. New Majri UG mine is situated in Wardha valley coalfields of WCL and is separated into two parts by Wani-Rajur railway line, namely southern part (earlier designated as Opencast area) and northern part (earlier designated as Underground area). Both these areas have been extensively worked by underground workings by New Majri Incline No. 1 & 2, 3 & 4 and Naglone Incline. Presently, in the southern part New Majri Sector – IA & IIA Extension OC mine is under operation which has balance life of 5 years and there is no further scope of expansion of this mine in dip side due to Wardha river. The northern part of the underground mine has been converted to opencast mine upto the depth of 90 m i.e. New Majri UG to OC mine. Coal reserves are available in the dip side of New Majri UG to OC mine for its further expansion.

New Majri underground colliery has been extensively worked since pre-nationalisation days developing only 6 m thickness (in two sections) out of a total of about 17 m of workable composite coal seam by Board & Pillar method of working. The underground mining operations have involved development in two sections of 3m each by Board & Pillar method and depillaring by split & stowing or slicing & stowing. The Bord and Pillar method of underground mine workings have substantial balance reserves in the form of stooks and pillars apart from remaining thickness of composite seam (only 6m out of about 17m thick composite seam has been worked by underground method). About 20% to 86% of the coal reserves were extracted in the underground mine by Board & Pillar method of working up to 6 m thickness

in two sections.

Accordingly, the PR for conversion of New Majri UG mine (northern side of Railway line) into opencast mine was prepared in March, 2007 for a target capacity of 0.80 Mty for extraction of maximum possible coal reserves. This PR for New Majri UG to OC mine was approved by WCL Board in its 207th meeting

held on 15.11.2007 on Partial Hiring Option subject to Cost Plus agreement with prospective customer.

Subsequently, due to delay in cost plus agreement with prospective customer, WCL Board in its 237th meeting held on 31st March, 2012 permitted to continue the production from existing UG mine by carving out reserves from approved PR. Accordingly, the original PR was updated as on June, 2012 considering reduced mineable reserves after carving out reserves to be worked by underground mining till the start of OC mine, enhancement of one time monetary compensation package in lieu of employment, GCV based notified price of coal and other relevant changes applicable to PR.

The salient features of the updated PR (June, 2012) are tabulated below :-

Sl. No.	Particulars	
1	Additional Capital (Rs. In crores)	172.6857
2	Cost of Production at 100% Capacity (Rs./t)	1422.05
3	Av. Selling Price / Notified Price Of Coal (Rs./t)	770.50
4	IRR at 85% Capacity (%)	NEGATIVE
5	Price to yield 12% IRR at 85% Capacity (Rs./t)	1787.19

Based on this updated PR (June, 2012), WCL entered into Coal Supply Agreement (to supply coal from New Majri UG to OC) with MAHAGENCO (Maharashtra State Power Generation Company Limited) for existing power plants on 30th June, 2012. As per this contract the base price was Rs. 1787.19 per tonne. In the mean-time, Maharashtra Govt. increased the land price and the PR of New Majri UG to OC was again updated as on August, 2013 to assess the impact of revision of land price on the economics of PR. The salient features of this updated PR (Aug, 2013) are as tabulated below :-

Sl. No.	Particulars	
	Additional Capital (Rs. In crores)	303.7025
2	Cost of Production at 100% Capacity (Rs./t)	1623.17
3	Av. Selling Price / Notified Price of Coal (Rs./t)	770.50
4	IRR at 85% Capacity (%) at Notified Price	NEGATIVE
5	Price to yield 12% IRR at 85% Capacity (Rs./t)	2186.25

Since the price to yield 12% IRR at 85% capacity (Rs. 2186.25/t) was more than the contract price as per the agreement with MSPGCL, the proposed New Majri UG to OC mine could not be started.

Subsequently, new norms of PR preparation were approved by CIL in its 310th Board meeting held on 08.11.2014 subject to vetting by Institute of Cost Accountants of India. In addition to this, in pursuant to Cenvat Credit rules intimated by WCL, it was decided to exclude Service Tax while calculating hiring rates for overburden. Accordingly the Project Report of New Majri UG to OC mine was again updated in December, 2014 for Partial Hiring Option on the basis of new norms. The price to yield 12% IRR at 85% capacity as per the updated PR was Rs. 1837.94/t and a fresh coal Supply agreement was done with MAHAGENCO on 09.05.2015 based on the updated PR. Subsequently, this Project Report of New Majri UG to OC (December, 2014) was approved in the 265th meeting of WCL Board on 23rd May, 2015 for a capacity of 0.8 Mty at an additional capital requirement of Rs. 295.5646 crores (excluding existing capital of Rs. 4.1121 crores) on partial hiring option based on coal supply agreement with MAHAGENCO on cost plus basis.

New Majri UG to OC mine started production after approval of PR on 23.05.2015 and achieved its target capacity in 1st year itself (2015-16). Since, the mine had potential to produce more than target capacity, a Mining Plan was prepared for enhanced capacity of 1.20 Mty which was approved by WCL Board on 29.09.2016. Based on this Mining Plan, EC for 1.20 Mty capacity was obtained from MOEF on 13.02.2017.

The existing New Majri UG to OC mine is being worked as per the Coal Supply agreement with MAHAGENCO and the present escalated contract price applicable for the period from July, 2018 to December, 2018 as per the approved Escalation Formula is Rs. 2073.15/t.

Chronology of the previous approved reports are as follows:-

Sl. No.	Name of PR	Year of Approval	Production Capacity (Mty)	Approved Capital (Rs.Crores)
1	PR for New Majri UG to OC (March 2007)	15.11.2007 (Subject to cost plus agreement)	0.80	72.5739 (excluding WDV of 4.5316)

Sl. No.	Name of PR	Year of Approval	Production Capacity (Mty)	Approved Capital (Rs.Crores)
2	Updated PR of New Majri UG to OC (December, 2014)	23.05.2015 (after cost plus agreement with MAHAGENCO on 09.05.2015)	0.80	295.5646 (excluding WDV of 4.1121)
3	Mining Plan for 1.20 Mty Capacity	29.09.2016	1.20	-

1.2 SALIENT FEATURES OF THE LAST APPROVED REPORT

The Salient Feature of last approved PR (December, 2014) which was approved by WCL Board on 23rd May, 2015 are tabulated below :

Sl. No.	**Particulars**	**PR (December, 2014) (Approved on 23.05.2015)**
A	**General Parameters**	
01	Balance Mineable Reserves (Mt)	12.00
02	Grade & GCV of coal (with 5 cm dilution at each contact point)	G-11 (GCV - 4115 kCal/kg)
03	Target Production (Mty)	0.80
04	Volume of Overburden	43.05
05	Average S/R (m3/t)	3.59
06	Manpower requirement (nos)	361
07	Overall OMS (t)	8.394
08	Capital Requirement (Rs. In crores) Additional Capital WDV of Existing assets Total Capital	 295.5646 4.1121 299.6767
09	Cost of Production (Rs/t) a) At 100% of target capacity b) At 85% of target capacity	 1329.56 1496.55

Sl. No.	Particulars	PR (December, 2014) (Approved on 23.05.2015)
B	**Financial parameters**	Power Sector
10	Average Notified Selling Price (Rs/t)	877.00
11	Profit (+)/ Loss (-) (Rs/t) at Notified Price a) At 100% of target capacity b) At 85% of target capacity	 (-) 452.56 (-) 619.55
12	Financial IRR at Notified Price a) At 100% of target capacity b) At 85% of target capacity	 Negative Negative
13	Contract Price as per Cost Plus Agreement with MAHAGENCO	1837.94
14	Profit (+)/ Loss (-) (Rs/t) at Contract Price a) At 100% of target capacity b) At 85% of target capacity	 (+) 508.38 (+) 341.39
15	Financial IRR at Contract Price a) At 85% of target capacity	 12 %

1.3 PRESENT STATUS OF THE MINE

1.3.1 Production

New Majri UG to OC mine started production after approval of PR on 23.05.2015 and achieved its target capacity of 0.80 Mty in its 1st year (2015-16). Subsequently, a Mining Plan was prepared for enhanced capacity of 1.20 Mty which was approved by WCL Board on 29.09.2016. Based on this Mining Plan, EC for 1.20 Mty capacity was obtained from MOEF on 13.02.2017. The mine achieved 1.20 Mty capacity in the year 2016-17 and 2017-18 by Partial hiring option.

Out of total 12 Mt of coal and 43.05 Mm^3 OB as per approved PR, the mine has produced 3.20 Mt of coal and removed 10.31 Mm^3 OB as on 31.03.2018. The year-wise coal production and OB removal from New Majri UG to OC mine since inception are tabulated below :

Year	Coal Production (Mty)	OB Removal (Mm^3)
2015-16	0.80	2.714
2016-17	1.20	3.982
2017-18	1.20	3.616
Total	**3.20**	**10.312**

1.3.2 Land Acquisition

The total land as per the approved PR of New Majri UG to OC mine (approved on 23.05.2015) was 484.16 ha. However, as communicated by Mine/Area, the land area within the approved Mine boundary based on the Govt. land records is 479.16 ha. Out of this 479.16 ha land requirement, about 455.77 ha land has been acquired by WCL as on 01.04.2018.

The total land requirement as well as the land already acquired upto 01.04.2018 in existing New Majri UG to OC mine along with break-up under tenancy, forest and Govt land are tabulated below :

Sl. No	Details	Tenancy Land (Ha)	Govt. Land (Ha)	Forest Land (Ha)	Total Land (Ha)
1	Total Land within the approved Mine Boundary	460.21	18.95	Nil	479.16
2	Land Already acquired by WCL	436.82	18.95	Nil	455.77
3	Balance Land to be acquired	23.39	Nil	Nil	23.39

1.3.3 Manpower

The total existing Manpower in New Majri UG to OC mine as on 01.04.2018 is 427. The details are as follows:

Particulars	Executives	Monthly	Daily Rated	Total
Manpower	23	113	291	427

1.3.4 Financial Performance

The physical and financial performance of the mine since its inception (2015-16 onwards) are as follows :

Sl. No.	Description	2015-16	2016-17	2017-18
1	Coal Production (Mt) (Dept.)	0.80	1.20	1.20
2	OB Removal (Mm^3) (Hiring)	2.738	3.928	3.490
3	Manpower (Dept.)	505	420	381
4	Cost of Production (Rs./t)	851.85	1090.94	1235.48
5	Sale Realisation (Rs./t)	970.93	2485.87	2332.57
6	Profit (+) / Loss (-) on Coal Rs./t)	119.07	1394.92	1097.09
7	Accretion / Decretion in Stock & Misc.	397.60	(-) 119.33	(-) 137.74
8	Overall Profit (+) / Loss (-) (Rs./t)	516.67	1275.60	959.35
9	Overall Profit (+) / Loss (-) (Rs in Crores)	41.33	153.07	115.12

1.4 JUSTIFICATION OF EXPANSION PR

New Majri UG to OC mine was planned for a target capacity of 0.80 Mty with a total production life of 17 years. Although there was further scope of increasing the target capacity of the project, one of the criteria for deciding target capacity of the project was to get a reasonable life of 15 to 20 years.

Recently, WCL has decided to liquidate the mineable reserves of operating / on-going opencast projects at a faster pace with the available infrastructure and land even with reduced life of the mine. Accordingly, a Mining Plan was prepared for 1.20 Mty capacity which was approved by WCL Board on 29.09.2016. Based on this Mining Plan, EC for 1.20 Mty capacity was obtained from MOEF on 13.02.2017. The mine is producing peak target capacity of 1.20 Mty since last two years (2016-17 and 2017-18).

Most of the underground and opencast mines of Majri Area of WCL have exhausted resulting into idle manpower and machinery. Presently only three mines namely New Majri UG to OC, New Majri Sector-IA & IIA Ext. OC and Amalgamated Yekona-I & II OC mine are operating in the entire Area. Out of the

three operating mines, New Majri Sector-IA and IIA Extension OC which is adjacent to New majri UG to OC mine, has balance life of about 5 years. Hence, it is very important to either open new mines or increase the capacity of existing mines in Majri Area to sustain the production and to gainfully utilize the manpower and machinery. There are few new Blocks in Majri Area which are not promising and only option left is to augment the production capacity of existing mines.

New Majri UG to OC mine has longer strike length and therefore the production capacity can be increased to 3.0 Mty if the entire strike length is opened. Coal reserves are available in dip side of existing boundary of New Majri UG to OC mine and there is scope of further expansion of the mine in dip side to have additional mineable reserves for reasonable mine life at enhanced target capacity of 3.0 Mty. However, the difficulties associated with the expansion of mine is higher stripping ratio and steep gradient of seam requiring more land for external OB dumping as simultaneous internal dumping is not feasible. However, this difficulty can be sorted out by dumping

the OB in the void of adjacent New Majri Sector-IA & IIA Extension OC mine after its exhaustion. New Majri Sector-IA and IIA Extension OC is the adjacent mine located in the southern side of Wani-Rajur railway line which has balance life of about 5 years. There is no further scope of extension of this mine in dip side due to Wardha river. Thus, the void of this mine can be used for dumping of OB of proposed New Majri UG to OC Expansion mine without additional land requirement for OB dumping. This will also help in offsetting the cost due to higher stripping ratio as requirement of additional land for OB dumping is nil.

In view of above, the proposed PR of New Majri UG to OC Expansion mine for 3.00 Mty capacity is justified.

1.5 SALIENT FEATURES OF PRESENT PROJECT REPORT

1.5.1 Different Variants considered for PR Formulation

This Project Report for Expansion of New Majri jri UG to OC mine has been prepared for the following options :

Departmental Option : Extraction of entire coal and OB by departmental HEMM.

Partial Hiring Option : Extarction of entire Coal, immediate 5m hard cover above coal seam top by departmental HEMM and Top OB beyond 5 m cover by hiring of HEMM

Total Hiring Option : Entire coal and OB by hiring / out-sourcing of HEMM

1.5.2 Salient Features of present Expansion PR

The Conceptual Note on PR for Expansion of New Majri UG to OC mine was presented and discussed at CMPDI (HQ), Ranchi and WCL (HQ), Nagpur on 09.11.2018 and 12.11.2018 respectively. The Minutes of the above meetings are enclosed as Annexures in this report. Subsequently, the Draft PR for Expansion of New Majri UG to OC mine was prepared considering the Comments/ suggestions of various departments of CMPDI (HQ), WCL (HQ) and Majri Area.

The Draft PR for Expansion of New Majri UG to OC mine was discussed with CMPDI (HQ), Ranchi through video conferencing on 07.03.2019 and in the Planning Committee meeting at WCL(HQ) on 08.03.2019. The minutes of the above meetings are enclosed as Annexures in this report. Based on the decisions taken in the above meetings and comments/ suggestions received from various departments of CMPDI (HQ) and WCL, the Final Project Report for Expansion of New Majri UG to OC mine has been prepared for 3.0 Mty capacity in three options i.e. Departmental Option, Partial Hiring Option and Total Hiring Option in March, 2019.

The Salient Features of the Final Project Report for Expansion of New Majri UG to OC mine (3.0 Mty) prepared in March, 2019 for all the three options Departmental option, Partial Hiring option and Total Hiring option) are tabulated below :

Sl. No.	Particulars	Depart-mental option	Partial Hiring option	Total Hiring option
A	**General Parameters:**			
1	Mineable Reserves (Mt)	36.09		
2	GCV(kCal/kg)	'G-11' (GCV-4115 kCal/kg)		
3	Volume of Overburden (Mm^3)	373.18		
4	Average S/R (m^3/t)	10.34		

Sl. No.	Particulars	Depart-mental option	Partial Hiring option	Total Hiring option
5	Mine Capacity (Mty)	3.00		
6	Manpower (Nos.) a) Requirement b) Existing as on 01.04.2018 c) Additional by land acquisition d) Total Manpower available (b+c) e) Surplus (+) / Deficit (-)	 1535 427 301 728 (-) 807	 549 427 301 728 (+) 179	 298 427 301 728 (+) 430
7	OMS (t) based on requirement	7.403	20.699	38.133
8	Total Capital Required (Rs.in Crs.) a) Additional Capital b) WDV as on 01.04.2018	1616.4080 1522.2993 94.1087	496.3829 402.2742 94.1087	408.2765 314.1678 94.1087
9	Cost of Production (Rs./t)			
9.1	@ 100% of target capacity	2790.15	2241.65	2083.48
9.2	@ 85% of target capacity (Rs./t)	3155.80	2389.71	2197.41
10	Av. Selling Price (Notified) (Rs./t) for Power Sector	1224.75	1224.75	1224.75
11a	Profit/Loss (Rs./t) for Power Sector on Notified Price			
11.1	@ 100% of target capacity	(-)1565.40	(-)1016.90	(-) 858.73
11.2	@ 85% of target capacity	(-)1931.05	(-)1164.96	(-) 972.66
12	Financial IRR (%) for Power Sector			
12.1	@ 100% of target capacity	Negative	Negative	Negative
12.2	@ 85% of target capacity	Negative	Negative	Negative
13	Price to yield 12% IRR at 85% capacity (Rs./t)	2726.05	2213.49	2010.07
14	Difference between Notified Price and Price to yield 12% IRR at 85% capacity	(-)1501.30	(-) 988.74	(-) 785.32

2.0 MARKETABILITY & JUSTIFICATION

2.1 The mines of WCL are under constant pressure to meet the increasing demand of non-coking coal for power houses and other bulk consumers from Western as well as Southern part of country. The justification of this mine has been studied

in the light of estimated demand for non-coking coal from power sector in Maharashtra and production forecast from existing, completed, ongoing and future projects of WCL.

2.2 DEFICIT IN AVAILABILITY OF COAL FROM WCL

Following table shows the deficit in availability of coal, including middling, from the various Existing, Completed, On-going, and Future Projects of WCL:

Demand, Supply and Deficit in Availability of Coal

Sl. No.	Sector	Projections of Surplus / Deficit of Coal (Mt)			
		2018-19	2019-20	2020-21	2021-22
1	Total FSA/LOA Commitment + proposed E-Auction	92.415	89.272	87.849	83.502
2	Availability of coal	52.50	55.00	60.00	60.00
3	Surplus / Deficit (+/-)	(-) 39.915	(-) 34.272	(-) 27.849	(-) 23.502

From the above table, it is clear that the deficit in supply of coal from WCL is 39.915 Mt in 2018-19 which will be narrowed down to 27.849 Mt in 2020-21 and 23.502 Mt in 2021-22 if WCL achieves the target capacity of 60 Mt in 2020-21.

2.3 AVAILABLE LINKAGE OR FIRM FUEL SUPPLY AGREEMENT (FSA)

There is firm fuel supply agreement for the existing New Majri UG to OC mine with Mahagenco to supply 0.68 Mty coal (85% of 0.80 Mty) at cost plus price. For the balance coal of the proposed Expansion OC mine, fuel supply agreement on cost plus basis with eligible customers will have to be ensured prior to approval of this project..

2.6 JUSTIFICATION AND MARKETABILITY

From the tables given in para no. 2.2, it is clear that the deficit in supply of coal from WCL is 39.915 Mt in 2018-19 which will be narrowed down to 27.849 Mt in 2020-21 and 23.502 Mt in 2021-22, if WCL achieves the target capacity of 60 Mt in 2020-21. To further reduce the gap between demand and supply of coal, it is very essential to either open new mines or increase the production from existing mines of WCL. Thus, proposed PR for Expansion of New Majri UG to OC mine having target capacity of 3.00 Mty will help to reduce the gap between demand and supply of coal from WCL mines.

3.0 PROJECT SITE INFORMATION

3.1 LOCATION, ACCESSIBILITY AND COMMUNICATION

The proposed New Majri UG to OC Expansion mine is located in Majri Area of WCL in Chandrapur district of Maharashtra state. The area is at a distance of about 140 km from Nagpur via Warora. The Majri railway station, within the area is located about 17 km from Warora railway station on the Wardha – Kazipeth main branch of Central Railway. The Majri-Wani branch line passes through the central part of New Majri Colliery separating New Majri UG to OC mine in northern side from New Majri Sector-IA & IIA Extension OC in southern side.

3.2 TOPOGRAPHY , DRAINAGE & RAINFALL

The characteristic land pattern of Naglone area is a north-south trending raised ground in the central part between the altitudes 190 m to 194 m. The western part of this raised ground slopes into Wardha River. The HFL of Wardha River is reported to be 193.65 m as observed in 1994 in New Majri Colliery area with reference to the assumed RL of Bench Mark of the colliery.

The Koradi nala with its branches and gullies passes through the eastern part of Naglone block and joins with Shirna nala further to the east. The HFL of Koradi nala & Shirna nala is reported to be 192.45 m. The entire up-dip side of the Naglone Area i.e. the possible quarriable zone is under the HFL because of these nalas flowing through the area. The topography in this part varies between 185 m to 190 m.

The average annual rainfall is about 1200 mm, the major part of precipitation during the rainy season. Further , the maximum rainfall of 201.30 mm in a day has been recorded on 12th July, 1994. The maximum and minimum rainfall of 1740 mm (2005) and 650.3 mm (2003) respectively have been recorded in the area.

4.0 GEOLOGY AND DEPOSIT APPRAISAL

4.1 BLOCK BOUNDARIES

The part of New Majri UG mine falling in the northern side of Majri-Wani Railway line has been considered as Geological Block for the purpose of proposed New Majri UG to OC Expansion mine,. The Minex model of the above Geological block has been prepared with structure of entire block upto Wardha river.

However, very few boreholes are available in dip side and underground workings exist only up to 250 to 280m depth. Hence, in absence of data beyond 250m depth, reserve estimation of the geological block has been carried out only upto 250m depth.

The limit of above Geological Block (part of Majri UG block in the northern side of Railway line) are as follows :

Geological Block Boundary

North	-	F_6-F_6 Boundary fault & Naglone – Patala Road dividing Southern Boundary of Yekona block and New Majri block
South	-	Railway Line
East	-	Subcrop of Composite Seam
West	-	Wardha River

4.2 BOREHOLE DENSITY

The total area of the block (northern side of railway line) is 3.82 km^2 and the borehole density with total 34 boreholes works out to 8.90 boreholes/km^2. Most of the above boreholes have been drilled to delineate the Fault (F_6-F_6) and Subcrop of the composite seam. The existing underground workings are also limited upto the depth of 250m to 280m. Hence, the average borehole density for the entire block will not truly represent the exploration status.

The proposed New Majri UG to OC Expansion mine has been envisaged upto 250m depth and the total boreholes in the quarry area is 21 in 2.78 km^2 area. Thus, borehole density in the quarry area works out to 7.55 boreholes/km^2.

4.3 STRUCTURE OF THE QUARRY AREA

4.3.1 Strike and Dip

Overall Strike is NW-SE with a strike length of approx. 2.8 km. The bed dips towards SW throughout the Block. The gradient ranges from 1 in 4.6 in Northern part to 1 in 4.8 in the Southern part.

4.3.2 Faults

Details of 3 faults encountered in the area considered are provided in Table below:

Details of Faults

Sl No.	Fault No.	Strike of fault	Amount and Direction of throw	Linear Extension (approx.)	Nature and Evidence
1	F6-F6 (Boundary Fault)	Almost NW-SE	150m towards SW	1.4km	1. Oblique fault. 2. Evidence of Talchir Formation at depth of 29.65m & 39.85m at CMWN-08 & 04 respectively against existence of coal seams at 46.30m & 52.00m in CMWN-05 & 18 respectively.
2	F6A-F6A	Almost E-W	About 0 to 20m towards N	0.405 Kms	1. Strike/Oblique fault. 2. Absence of Composite seam in B.H.No CMWNM-89 &91 3. Part thickness of Composite Seam due to faulted floor in CMWNM-90 4. Difference in FRL values of B.H.No. CMWKH-209 on the Downthrown side and CMWKH-193 on the Upthrown side.
3	FF-FF	Almost NW-SE	About 0m to 5m towards SW	0.293 km	1. Strike fault 2. Difference in Floor contour level between CMWN-07 & 19

4.4 COAL SEAM

4.4.1 DESCRIPTION OF SEAM-SECTIONS

The thickness of Top section, Bottom section and the parting in between as encountered in different boreholes are tabulated below :

Coal Seam/ Section	Thickness range (m)		Average thickness (m)
	Min.	Max.	
Top Section	7.99 (CMWN-11)	13.00 (CMWN-18)	10.64
Parting	0.70 (CMWN-18)	1.99 (CMWN-11)	1.43
Bottom Section	4.32 (CMWN-10)	5.19 (CMWN-18)	4.90
Composite Seam	12.88 (CMWN-10)	18.89 (CMWN-18)	17.00

4.4.2 Underground Workings

As reported by Colliery authorities, the underground workings of New Majri mine are located in two sections each of 3m thickness. 3m of Bottom Section development is located at the lower part of the Bottom Section and similarly 3m of Top Section development is located in the lower part of Top Section of the Composite seam. Thus, a substantial reserves of Composite seam are still left in these seam-sections.

4.5 COAL QUALITY

Overall Quality

In the available geological assessment of the block, the seam quality is estimated by dividing the seam into two sections viz. Top Section & Bottom Section. The parting between two sections is composed of shale, carb. shale, shaly coal and coal that is difficult to separate during opencast mining. As such, quality of composite seam has been estimated by including this parting.

In addition to this, 0.05 m dilution at two contact points has been considered for evaluation of quality of coal. Additional 0.20 m dilution has been taken due to sand stowing done in underground working during depillaring operation. Coal face would have to be blanketed by overburden material to prevent fire in exposed coal galleries, which would result into contamination of coal. Dilution of 0.05 m has been considered due to effect of this blanketing.

Considering all the above factors, Coal quality with different dilution criteria has been tabulated as below:-

PARTICULARS	M %	Ash %	UHV (kcal/kg)	Grade	GCV (kcal/kg)
Top Section + Parting + Bottom Section	7.0	32.35	3470	E	4475
0.05 m dilution at each contact point & effect of sand stowing (without blanketing)	6.9	34.40	3200	F	4290
0.05 m dilution at each contact point, effect of sand stowing & Blanketing	6.8	36.39	2940	F	4115

Thus, the overall quality of coal including parting and contamination due to mixing of stowed sand and OB for blanketing in the proposed PR works out to **G-11 (4115 kCal/kg).**

4.6 GEOLOGICAL RESERVES

4.6.1 General

a) Resources have been estimated for Composite seam (Top Section + Parting + Bottom Section) up to a depth of 250m under Proved category. Beyond 250m depth, boreholes are not available and underground workings also do not exist beyond 300m depth. Hence no resource estimation has been carried out beyond 250m depth.

b) Due to steep gradient of seam, presence of developed and depillared underground workings and the physical nature of parting (e.g. carb. shale, shaley coal), it is difficult for identification and selective digging of parting. Hence, the resource estimation has been carried out for the entire thickness of composite seam including parting.

4.6.2 Reserve Estimation

Total 83.050 Mt coal reserves have been estimated in the proposed area upto 250m depth. The depth wise and thickness wise net insitu geological reserves are tabulated below :

Net Proved In-situ Geological Reserves (in million tonnes)

DEPTH (m)	SEAM THICKNESS RANGE (m)							Grand Total
	12-13	13-14	14-15	15-16	16-17	17-18	18-19	
0-50	0.072	0.602	0.449	1.078	1.883	0.390	0.118	4.592
50-100	0.030	0.347	1.068	6.905	5.412	2.176	1.002	16.940
100-150	0.007	0.029	0.022	10.743	6.344	2.718	0.374	20.237
150-200	0.012	0.043	2.258	9.205	6.885	1.715	0.287	20.406
200-250	-	0	4.419	11.154	4.216	0.968	0.118	20.875
Total	**0.122**	**1.021**	**8.216**	**39.085**	**24.740**	**7.967**	**1.899**	**83.050**

N.B. - Geological resources have been calculated using Minex software. Area falling in heave zones of faults has been excluded while measuring the coal-bearing areas involved in resource estimation.

5.0 MINE BOUNDARIES, RESERVES & MINE LIFE

5.1 MINE BOUNDARY OF EXISTING NEW MAJRI UG TO OC MINE

The existing New Majri UG to OC mine has been planned in part area of New Majri UG block in the northern side of Wani-Majri Railway line. The southern boundary of the existing quarry has been planned leaving safe distance from railway line and other surface infrastructure like hospital etc. The northern boundary of the quarry is limited by boundary fault F_6-F_6 and Naglone-Patala road separating New Majri and Yekona blocks. The eastern rise side quarry floor is limited by incrop of composite seam. The western dip side boundary of the existing quarry is limited upto 90m depth which corresponds to 100m FRL at the floor of composite seam. Thus the mine boundary of existing New Majri UG to OC mine is as follows :

East (rise side)	-	Subcrop of Seam at 2.0m thickness
West (dip side)	-	At about 90 m depth or 100 m FRL
North	-	F_6-F_6 Boundary fault & Naglone –Patala Road dividing Southern Boundary of Yekona block and New Majri block
South	-	200 m barrier from surface infrastructures like Railway Line, Hospital etc.

5.2 MINE BOUNDARY DELINITION FOR EXPANSION MINE

5.2.1 Selection of Seam

The proposed New Majri UG to OC Expansion mine is dip side expansion of existing New Majri UG to OC mine from 90m depth to 250m depth. Presently, the entire composite seam including parting is being worked in existing mine and the same will be continued in the proposed Expansion PR of the OC mine.

5.2.2 Pit Formulation Strategy

1. The sub-crop of composite seam in rise side of existing quarry is the eastern quarry floor boundary of the proposed expansion mine.

2. In the northern side, the existing quarry floor is limited by road connecting Nagalone village to Patala village and F_6-F_6 fault which forms the northern quarry floor limit. The northern quarry surface limit of the proposed New Majri UG to OC

Expansion mine has been planned leaving safe distance from this road. Thus, fault F_6-F_6 and the Nagalone village to Patala village road define the northern boundary of the proposed expansion mine.

3. In the southern side, various infrastructure like quarters, hutments, office, water filter plant, Area hospital, playground, Rly. Quarters, sub-station etc. are located along the Wani-Majri railway line. Accordingly, the southern quarry surface of the proposed expansion mine has been planned leaving safe distance from these surface infrastructure.

4. The existing New Majri UG to OC has been planned upto 90 m depth. Following alternatives have been worked out to decide the western dip side limit of the proposed expansion OC mine:

Alternative No.	Maximum Depth of Quarry	Balance Coal (Mt)	OB (Mm^3)	Stripping Ratio (m^3/t)
I	100m depth	10.29	42.85	4.17
II	150m depth	18.51	124.47	6.72
III	200m depth	27.12	236.13	8.71
IV	250m depth	36.09	373.18	10.34

Due to availability of longer strike length, the proposed Expansion mine may be planned for higher target capacity which requires higher mineable reserves to get a reasonable life. Hence, Alternative-IV (250m depth) has been considered in this PR for Expansion of New Majri UG to OC mine.

However, the project boundary has been envisaged upto Wardha river in dip side considering that the land between the proposed quarry boundary and Wardha river is below HFL and tenants may face problem due to vicinity of quarry in one side and Wardha river on the other side. The embankment has been proposed along Wardha river to avoid frequent shifting of embankment. It is proposed in this PR to explore the reserves beyond 250m depth for future expansion of quarry and provision for the same has been made in this Expansion PR.

5.2.3 Quarry Boundary

Considering the above pit formulation strategy, the mine boundary of the proposed New Majri UG to OC Expansion mine are as follows:

East (Rise side)	:	Subcrop of Composite Seam
West (Dip side)	:	At about 250 m Depth line
North	:	Fault F_6 – F_6 Boundary fault and upto 85 m away from the road connecting Naglone village to Patala village
South	:	Safety distance of 100 m from surface Infrastructures and railway line

5.3 MINEABLE RESERVES

5.3.1 Net In-situ Geological Reserves

As detailed in Para 4.6, the total net in-situ geological reserves in proposed Mining Block (part area of New Majri UG block lying in the north side of Wani-Majri Railway line upto 250m depth) is estimated as 83.050 Mt

5.3.2 Geological Reserves Blocked / To be worked in Future

The total geological Reserves blocked under various heads and not considered in the proposed Quarry of New Majri UG to OC Expansion mine are tabulated below. These reserves will be worked in future.

Geological Reserves Blocked / To Be Worked in Future

Sl. No.	Particulars	Net In-situ Geological reservers (Mt) Blocked / To be worked in Future
1	Reserves in between Wani – Majri Railway line and sourthern quarry floor limit blocked due to infrastructure like hospitals, quarters, store, office, safety distance from infrastructure and in southern quarry batter	24.154
2	Reserves in between Boundary Fault F_6-F_6 and northern quarry floor limit blocked due to Patala village road , safety distance from road and in northern side batter of quarry	8.067
	Total	**32.221**

5.3.3 Reserves Already Extracted by UG and OC Workings

Out of 83.050 Mt net in-situ geological reserves, 32.221 Mt is blocked due to various surface infrastructure and will be worked in future after dismantling of these structures. Hence, the total available net in-situ geological reserves within the quarry is 50.829 Mt. Out of this, reserves already extracted by underground and OC workings up to 31.03.2018 are tabulated below :

Sl. No.	Particulars	Reserves (Mt)
1	Reserves Already Extracted by underground mining in the quarriable area	9.64
2	Reserves already extracted by New Majri UG to OC mine up to 31.03.2018	3.20
	Total	**12.84**

5.3.4 Mining losses and Balance Mineable Reserves as on 01.04.2018

Out of 50.829 Mt geological reserves available within the quarry area, about 12.84 Mt has already been extracted from UG workings (9.64 Mt) and OC workings (3.20 Mt). Thus net geological reserves available in the quarry as on 01.04.2018 works out to 37.99 Mt. Considering 5% mining losses during opencast mining, the net mineable reserves as on 01.04.2018 works out to **36.09 Mt** (37.99 Mt x 0.95).

5.4 TARGET PRODUCTION

The proposed PR for New Majri UG to OC Expansion mine has been prepared for a targeted capacity of **3.00 Mt/annum**

However, in favourable geo-mining and other conditions such as availability of greater strike length, flatter gradient, less number of rainy days in monsoon etc., the mine can achieve a Peak production up to **3.75 Mty.** Hence, the peak production of 3.75 Mty has been recommended in this PR for obtaining Environmental clearance.

5.5 MINE LIFE

The total mineable reserves in proposed New Majri UG to OC Expansion mine is 36.09 Mt. Considering the proposed rated output of mine as **3.00 Mty** of ROM

Coal, the total life of the mine is estimated as **14 years** including 4 years production build-up period.

6.0 METHOD OF MINING

The existing New Majri UG to OC mine has been approved in Partial Hiring option on cost plus basis and the entire coal and 5m OB above the coal seam is being extracted by departmental Shovel Dumper combination. The rest OB removal is being done through out-sourcing agency with Shovel-Dumper system of mining. The proposed PR of New Majri UG to OC Expansion has envisaged increase in annual target production capacity from 1.20 Mty to 3.0 Mty by working entire strike length simultaneously. The entire OB is proposed to be dumped in external dump as well as in the void of adjacent New Majri Sector-IA & IIA OC mine which is likely to be exhausted in next 4 to 5 years.

The proposed PR of New Majri UG to OC Expansion mine has been prepared for three options i.e. Departmental, Partial Hiring and Total Hiring option.

6.1 GEO-MINING CHARACTERISTICS

6.2 GEO-MINING PARAMETERS

The geo-mining characteristics of the proposed quarry are as follows:-

Sl. No.	Particulars	Qty.
1.	Area of the Quarry	
a)	On floor (ha)	235.03
b)	On surface (ha)	358.35
2.	Depth (m)	
a)	Initial	52
b)	Final	250
3.	Gradient of Seam	1 in 4.6 in Northern part to 1 in 4.8 in Southern part
4.	Average thickness range of seams (m)	12.88 to 18.89
5.	Average Strike length (m)	2163
6.	Width on surface (m) [dip rise]	1316
7.	Width on floor (m) [dip rise]	1073
8.	Grade and GCV (kCal/kg) (0.05m dilution at each contact point)	'G-11' (GCV-4115)
9.	Mineable Reserves (Mt) as on 01.04.2018	36.09
10.	Total OB (Mm^3) as on 01.04.2018	373.18
11.	Average stripping ratio (m^3/t)	10.34

6.3 CHOICE OF TECHNOLOGY

In the proposed New Majri UG to OC Expansion mine, the gradient of seam is steep (1 in 4.6 to 1in 4.8) and the composite seam has been extensively worked by underground method of mining. Hence, deployment of dragline as well as Surface Miner is ruled out.

Shovel Dumper System is very flexible and convenient method of opencast mining and can deal with varying geo-mining conditions and developed seam by underground mining. This technology is well adopted in several opencast mines of WCL and skilled manpower is available for this method of mining. Shovel Dumper mining is being practiced in existing New Majri UG to OC mine and therefore, the same system of mining has been recommended in the proposed Expansion mine.

The gradient of coal seam in proposed New Majri UG to OC Expansion mine is steep (1 in 4.6 to 1in 4.8). In steep gradient, positioning of HEMM is difficult in inclined slicing method as the benches in coal are made parallel to the seam in this method. Hence this method is ruled out in proposed mine. Horizontal Slicing method of coal extraction is being worked in the existing New Majri UG to OC mine and the same system of coal seam extraction has been proposed in the PR for New Majri UG to OC Expansion mine.

6.4 DIFFERENT OPTIONS OF MINING

This Project Report of New Majri UG to OC Expansion mine whas been prepared for the following three options:-

6.4.1 Departmental Option

In Departmental option, entire OB removal and coal extraction will be carried out by departmental HEMM throughout the mine life except initial 2 years in which existing system of extraction of coal and 5m OB over coal seam by departmental HEMM and removal of OB by hiring of HEMM will be continued. Rehandling of OB for blanketting the fire during extraction of underground pillars as well as rehandling of stowed sand of UG workings are proposed by departmental HEMM. However, rehandling of Temporary OB dump will be carried out by hiring / out-sourcing agency.

6.4.2 Partial Hiring Option

In Partial hiring option, entire Top OB and rehandling of Temp. OB dump will be carried out by hiring / out-sourcing agency throughout the mine life. However, coal extraction and 5m hard cover above coal seam has been envisaged by Departmental HEMM. In addition to above, rehandling of OB for blanketting of fire during extraction of underground pillars and rehandling of stowed sand of UG workings will also be done by departmental HEMM

6.4.3 Total Hiring option

In Total Hiring Option, entire coal extraction and OB removal will be carried out by hiring / out-sourcing of HEMM throughout mine life except initial 2 years in which existing system of extraction of coal and 5m OB over coal seam by departmental HEMM and removal of OB by hiring of HEMM will be continued. Rehandling of Temporary OB dump, OB for blanketting of fire during extraction of underground pillars as well as rehandling of stowed sand of UG workings will also be done by outsourcing agency.

6.5 EQUIPMENT SELECTION

Shovel Dumper system of mining has been proposed in New Majri UG to OC Expansion mine. The equipment selection for coal extraction and OB removal in different options are detailed below :

The existing HEMM of New Majri UG to OC mine will be utilized in the proposed PR of New Majri UG to OC Expansion mine. These HEMM will be replaced / upgraded after their balance life and accordingly replacement capital has been provided.The major equipment proposed in the PR of New Majri UG to OC Expansion mine in Different Options are tabulated below :

LIST OF EXISTING AND PROPOSED HEMM

Sl. No.	Existing Equipment		Proposed Equipment		No. of Equipment		
	Particulars	Nos.	Particulars	New/ Repl.	Dept. Option	Partial Hiring Option	Total Hiring Option
A)	**TOP OB**						
1	Nil		10-12 m^3 Electric Hydraulic Shovel	New	13	-	-
2	Nil		100T RD Dumpers	New	151	-	-

Sl. No	Existing Equipment		Proposed Equipment		No. of Equipment		
	Particulars	Nos.	Particulars	New/ Repl.	Dept. Option	Partial Hiring Option	Total Hiring Option
3	Nil		250 mm dia. Drill	New	13	-	-
4	Nil		410 HP Dozers	New	13	-	-
B)	**COAL AND 5m OB ABOVE COAL SEAM**						
1	6.1 m^3 Diesel Hydraulic Shovel	1	4-5 m^3 Diesel Hyd Backhoe	Repl.	2	2	-
	4.5 m^3 Diesel Hyd Shovel	1		New	2	2	-
2	60T RD Dumpers	10	60T RD Dumpers	Repl.	10	10	-
				New	10	10	-
3	Nil		160mm dia. Drill	New	4	4	-
4	Nil		410 HP Dozer	New	4	4	-
C)	**COMMON HEMM**						
1	Nil		30/40t Crane	New	2	2	-
2	Nil		Mobile Crane 8-12t	New	1	1	1
4	Nil		28kl Water Sprinkler with Mist spray	New	2	2	2
5	Nil		5-6 m^3 Front End Loader	New	1	1	1
6	Nil		280 HP Motor Grader	New.	2	1	-
7	Nil		Mobile Maintenance Van	New	2	1	1
8	Nil		8/12 kL Diesel Bowser	New	2	1	-
9	Nil		Tyre Handler	New	2	1	-
10	Nil		Fire Fighting Truck	New	1	1	1
11	1.5 m^3 Diesel Hyd Backhoe	1	1.5 m^3 Diesel Hyd Backhoe	Repl.	1	1	1
12	Nil		410 HP Dozer (Coal stock)	New	1	1	1
D)	**RECLAMATION**						
1	Nil		28kl Water Tanker with Mist spray	New	1	1	-

6.6 SYSTEM PARAMETERS

6.6.1 Width and Height of working and non-working benches

For overburden, keeping the bench height of 10 m, the width of working and non-working benches are kept as 30 m and 20 m respectively in Departmental option. However, in hiring option, the actual bench width and height would depend upon the size of equipment deployed by the hiring / outsourcing agency. Haul road

would be constructed at a gradient of 1 in 16 with a width sufficient for dumper movement, dozer path, drainage and electrification etc. Height of benches in Top Soil strata has been considered as 3m for planning purpose.

6.6.2 Slope of Benches & Quarry

i) During mining operation

The slope of individual benches depends on the type of strata. In this report, the slope of individual bench is proposed as 45^o in soil, alluvium and clay whereas, it is 70^o in hard strata. The overall slope of the quarry in dip side during mining operation varies from 19^o to 21^o from horizontal plane depending on the nature of strata in the entire depth of quarry.

ii) At the end of quarry

The slope of individual benches in the batter at the end of quarry remains same as that during mining operation i.e. 45^o in soil, alluvium and clay and 70^o in hard strata. Overall angle of batter considered at the end of quarry is about 37^o for both dip side and rise side batter. Transport berm of 30m width has been proposed at every 30m vertical depth of quarry. However, It is proposed in this PR to carry out scientific study for slope and design of benches in quarry. Based on above scientific study, bench and quarry profile may change.

7.0 MINING STRATEGY

The proposed New Majri UG to OC Expansion mine is dip side (western side) extension of existing New Majri UG to OC mine of Majri Area, WCL. The existing New Majri UG to OC mine is being worked in Partial Hiring option and the mine has achieved 1.20 Mty Peak capacity as per existing EC. The coal and 5m OB above coal top is being extracted by departmental HEMM and rest entire OB by out-sourcing of HEMM.

There is scope for enhancement of target capacity of New Majri UG to OC mine upto 3.0 Mty provided the entire strike length is opened for quarry operation. However, internal dumping will not be feasible in such case and entire OB wil have to be accommodated outside the proposed mine. The adjacent New Majri Sector-IA and IIA Extension OC is being worked on the other side of Wani Majri Railway line which has balance life of 4 to 5 years. There is no further scope of expansion of New Majri Sector – IA & IIA Extension OC due to Wardha river in dip side. Thus, the void of this mine may be utilized for dumping of OB of

proposed New Majri UG to OC Expansion mine by making a Railway overbridge (ROB) or Railway under bridge (RUB) across the railway line. Considering all these factors, the proposed New Majri UG to OC Expansion mine has been planned for enhanced target capacity of 3.00 Mty. To have a sufficient life at enhanced target capacity, it is proposed to extend the mine in dip side upto 250m depth at the floor of composite seam.

7.1 CONSTRAINTS ON MINE DEVELOPMENT

Following surface constraints are envisaged in the proposed PR for Expansion of New Majri UG to OC mine:

7.1.1 Acquisition of Land and Dismantling of Hutments etc.

Total land within the mine boundary of existing New Majri UG to OC mine is 479.16 ha out of which 460.21 ha is tenancy land and balance 18.95 ha is govt. land. Out of this, 436.82 ha tenancy land and 18.95 ha govt. land have already been acquired by WCL. Balance 23.39 ha tenancy land is to be acquired. Further, the proposed expansion of mine in dip side has resulted in additional requirement of 227.12 Ha land (220.30 ha tenancy land and 6.82 govt. land). Thus, total 250.51 ha land including balance of 23.39 ha tenancy land of existing mine needs to be acquired in proposed PR for Expansion of New Majri UG to OC mine.

As per the data provided by Majri Area WCL, about 40 nos.of hutments/ quarters belonging to WCL employees in WCL land and 70 nos. of private hutments in private land are required to be dismantled as these hutments fall within safety zone of the mine. Accordingly, provision has been made in this report for above dismantling and shifting of houses. Acquisition of land and dismantling/shifting of hutments/quarters is one of the critical activities for the development of the mine.

7.1.2 Diversion of Electric Lines

One 66 kV and two 11 kV electric lines are passing through the property of proposed New Majri UG to OC Expansion mine which require diversion to work beyond the existing dip side mine boundary. Out of these three power lines, two power lines viz. 66 kV and 11 kV electric lines belonging to the mine and Majri area are proposed to be diverted along the rise side between quarry edge and the external dump. The 3rd power line of 11 kV capacity belonging to MSEB is proposed to be diverted along the dip side beyond the embankment and quarry

edge. Adequate capital provision has been made in this Expansion PR for above diversion of power lines.

7.1.3 OB Dumping

The gradient of coal seam in proposed New Majri UG to OC Expansion mine is steep and therefore simultaneous OB dumping is not feasible and entire OB from the quarry has to be accommodated in External OB dump. New Majri Sector-IA and IIA Extension OC is the adjacent mine located in the southern side of Wani-Rajur railway line which has balance life of about 5 years. There is no further scope of extension of this mine in dip side due to Wardha river. Thus, the void of this mine can be used for dumping of OB of proposed New Majri UG to OC Expansion mine without additional land requirement for OB dumping.

To facilitate the backfilling in the void of adjacent New Majri Sector-IA & IIA Extension OC mine, a rail over bridge (ROB) has been proposed to be constructed for dumpers to cross the Railway line. In addition to this, an alternative with Rail under bridge (RUB) has also been worked out and enclosed in this report as Annexure. Construction of rail over bridge (ROB) or rail over bridge (RUB) across Railway line is one of the most critical activity of this proposed expansion PR.

7.1.4 Diversion of Road

A road connecting Patala village with Majri railway station and other roads from Nagalone and kachuna pass over the proposed quarry area in the dip side. The diversion of road has been proposed in this expansion PR over the embankment in the dip side and adequate capital provision has been made in the report.

7.2 MINING STRATEGY

7.2.1 The proposed New Majri UG to OC Expansion mine is dip side expansion of existing New Majri UG to OC mine from approved PR boundary at 90m depth (90 to 100m FRL) to 250m depth (-55 FRL to -58 FRL) at the floor of composite seam. It is proposed to touch the composite coal seam through the existing access trench to the exposed coal face at 130 FRL and then deepen the mine along dip direction by opening total strike length of the mine.

The Expansion PR is planned for annual target coal production of 3.00 Mty and peak OB removal of 37 Mm^3/annum. Due to steep gradient of seam (1 in 4.5 to 1 in 4.8), no simultaneous backfilling has been proposed in the quarry and entire OB is proposed to be dumped externally in rise side OB dump as well as in the void of adjacent New Majri Sector-IA & IIA Extension OC beyond railway line. A Rail overrbridge (ROB) will be constructed for dumpers to cross the railway line to dump OB for which provision has been made in this PR. One more variant with Railway under bridge (RUB) in place of Railway over bridge has been worked out and the details are enclosed as Annexure in the PR.

7.2.2 Volume regime

The description of cuts are detailed below:

Description of Cuts

Cut	Description	Depth Range (m)	FRL Range (m)
Cut-IA	Area proposed to be worked in initial two years (2018-19 and 2019-20) as communicated by Mine/Area.	60 - 69	130 to 121
Cut-IB	Upto 100 m depth (90m FRL) at the floor of composite Seam	69 - 100	121 to 90
Cut-II	From 100m depth (90 m FRL) to 150m depth (40m FRL) at the floor of composite seam	100 - 150	90 to 40
Cut-III	From 150m depth (40 m FRL) to 200m depth (- 10 m FRL) at the floor of composite seam	150 - 200	40 to (-) 10
Cut-IV	From 200m depth (-10 m FRL) to 250m depth (-60 m FRL) at the floor of composite seam	200 - 250	(-) 10 to (-) 60

Details of these cuts along with quantities of coal, overburden and stripping ratio as on 01.04.2018 are as shown in the following Table :

Cut-wise Coal, OB & Stripping Ratio as on 01.04.2018

Cut	Depth Range (m)	FRL (m)	Coal (Mt)	OB (Mm^3)			S.R. (m^3/t)
				BC Soil	Hard OB	Total OB	
Cut-IA	60-69	130 to 121	2.40	1.01	6.44	7.45	3.10
Cut-IB	60-100	121 to 90	8.42	3.07	43.95	47.02	5.58

Cut	Depth Range (m)	FRL (m)	Coal (Mt)	OB (Mm^3)			S.R. (m^3/t)
				BC Soil	Hard OB	Total OB	
Cut-II	100-150	90 to 40	7.78	11.59	81.15	92.74	11.92
Cut-III	150-200	40 to -10	8.60	5.34	119.57	124.91	14.53
Cut-IV	200-250	-10 to -60	8.89	1.81	99.25	101.06	11.37
TOTAL			**36.09**	**22.82**	**350.36**	**373.18**	**10.34**

Black Cotton Soil

About 6 to 7 m top OB is black cotton soil in the proposed New Majri UG to OC Expansion mine. The total volume of balance black cotton soil required to be removed from the quarry as on 01.04.2018 works out to 22.82 Mm^3. Part of this black cotton soil (6.48 Mm^3) will be dumped initially in Temporary Top Soil Dump in the dip side on coal bearing area. Balance BC soil will be directly carpeted on the top of external OB dump as well as OB dump in adjacent New Majri Sector-IA & IIA OC mine.

7.2.3 Lead

Based on the quarry and OB dump configuration and distance between quarry and coal stock yard / OB dump, the following average haul distances (Lead) have been calculated for OB and coal.

a) For OB - 4.30 km (Range: Min: 2.75 Km to Max: 6.25 Km)

b) For Coal - 2.84 km (Range : Min: 2.50 Km to Max: 3.5 Km)

7.2.4 Mine Transport

The existing Access Trench of New Majri UG to OC mine will be utilized for the proposed Expansion mine to access the floor of the composite Seam. The width and gradient of Access Trench will be maintained as 30 m and 1 in 16 respectively. The gradient of haul road is proposed as 1:16.

For the transportation of OB, transport horizons (benches) have been proposed in the dip side & side batter at the interval of 30-40m RL.

7.3 DUMPING STRATEGY

The total volume of additional OB proposed to be excavated from the Quarry of New Majri UG to OC Expansion mine as on 01.04.2018 is 373.18 Mm^3. In addition to this, 0.50 Mm^3 OB of part of existing embankment in dip side of quarry will have to be rehandled due to expansion of mine in dip side. Thus, the total additional OB including the OB of part of existing embankment in dip side as on 01.04.2018 works out to 373.68 Mm^3 (373.18 Mm^3 from Quarry + 0.50 Mm^3 of part of existing embankment in dip side).

Due to steep gradient, no simultaneous backfilling has been proposed in New Majri UG to OC Expansion mine. The adjacent New Majri Sector IA & IIA Extension OC mine located in the south side beyond Wani-Majri Railway line is likely to be exhausted in next 5 years. There is no further scope of expansion of this mine in dip side due to Wardha river. Hence, it is proposed in this PR to utilize the void and surface area of New Majri Sector IA & IIA Extension OC for dumping of OB of proposed New Majri UG to OC Expansion mine. The entire balance 336.73 Mm^3 OB (373.68 Mm^3 – 32.45 Mm^3 in external rise side OB dump – 4.50 Mm^3 in embankment) will be accommodated in the void and surface area of New Majri Sector – IA & IIA OC mine after its exhaustion.

A railway over bridge (ROB) has been proposed for the dumpers to cross the railway line for OB dumping. Another alternative with Railway under bridge (RUB) has also been detailed in Annexure of this report.

Out of 373.18 Mm^3 OB generated from the quarry, the quantity of black cotton soil is 22.82 Mm^3. Initially, it is proposed to dump 6.48 Mm^3 BC soil in Temporary Top Soil Dump in the dip side on coal bearing area. This Temporary Top Soil Dump will be rehandled and carpeted on top of the hard OB dumps in the rise side of New Majri UG to OC Expansion mine and in the void of New Majri Sec-IA & IIA Extension OC mine.

7.3.1 DUMP CAPACITY

The different OB Dumps proposed in the mine along with their existing and additional dump capacity are tabulated below:

DUMP CAPACITY

Sl. No.	OB Dump	Location	Dump Height (m)	Capacity (Mm^3)	
				Existing (31.03.2018)	Additional
1.	**EXTERNAL OB DUMP**				
1.1	External Dump	Rise side of Quarry on eastern side non- coal bearing area	90m	6.39	32.45
1.2	External BC Soil Dump	Rise side of Quarry on eastern side non- coal bearing area	20m	1.20	-
1.3.	Embankment	Along Amb nala and seasonal nala	6m above HFL	2.72	4.50*
1.4	Temporary BC Soil Dump	Dip side Quarry area (to be reclaimed)	20 m	0	6.48
Total External Dump (Excluding Temp. Soil Dump)				**10.31**	**36.95***
2.	**INTERNAL DUMP**				
2.1	Adjacent Sector-IA & IIA Extension OC	In decoaled void of Sector – IA merged with external OB dump	Below GL & + 85m above GL		168.35
2.2		Decoaled Void of Sector - IIA			168.38
Total Internal Dump					**336.73**
Total External & Internal Dump (Excluding Temp. Dump)				**10.31**	**373.68**

* Including 0.5 Mm3 rehandling of existing Embankment.

From above, it is clear that about 90.11 % of total OB of proposed New Majri UG to OC Exansion mine will be accommodated in Internal dumps and only 8.89 % OB will be dumped in External OB dumps.

External OB dumps will be made of 15 m dump tier keeping berm of 6 m at 15m, 45m and 75m height and berm of 30 m at 30m and 60m height. With this bench pattern, the final angle of slope will be about 23^o for OB dump.

8.0 MINING SCHEDULE AND EQUIPMENT PHASING

8.1 ANNUAL PRODUCTIVITY OF HEMM PROPOSED

The annual productivity of HEMM proposed in Departmental and Partial Hiring Option are as follows:

Departmental Option

(A) For Top Overburden

Sl. No	Particulars	Productivity /Yr
1.	10.0-12.0 m^3 Electric hydraulic shovel with 100 T Rear Discharge dumpers	2.948 Mm^3
2	100 T Rear Discharge Dumpers for lead range of 2.50 km to 6.25 km with Electric Hyd. Shovel	0.3784 Mm^3 to 0.2350 Mm^3

(B) For Coal and 5m OB over Coal Top

Sl. No	Particulars	Productivity /Yr
i)	**For 5m OB over Coal Top**	
1.	4.5 m^3 Diesel Hydraulic Backhoe with 60 T Rear Discharge dumpers	1.265 Mm^3
2.	60 T Rear Discharge Dumpers for lead range 2.50 km to 5.75 km with Hydraulic Backhoe	0.2049 Mm^3 to 0.1331 Mm^3
ii)	**For Coal**	
1.	4.5 m^3 Diesel Hydraulic Backhoe with 60 T Rear Discharge dumpers	1.364 Mm^3
2.	60 T Rear Discharge Dumpers for lead range 2.50 km to 3.25 km with Hydraulic backhoe	0.2380 Mm^3 to 0.2085 Mm^3

(A) System Capacity

Based on the peak workload, equipment productivity and number of equipments proposed in the PR, the System Capaity of HEMM is tabulated below :

Particulars	Peak Annual Workload (Mm^3)	Annual Digging Capacity (Mm^3)	Annual Transport Capacity (Mm^3)	System Capacity (Mm^3)
Coal & 5m Top OB	1.82	2 x 1.364=2.728	8 x 0.2380=1.904	1.904
	1.52	2 x 1.265=2.530	12 x 0.1318=1.581	1.581
Top OB	35.48	13 x 2.948=38.324	151x0.2350=35.485	35.485
Total	**38.82**	**43.582**	**38.97**	**38.97**
Cushion %		12.26 %	0.38 %	0.38 %

From the above table it is clear that that the system capacity is limited by the transport capacity which is less than excavation capacity.

Partial Hiring Option

(A) For Coal and Parting

Sl. No	Particulars	Productivity /Yr
i)	**For 5m OB over Coal Top**	
1.	4.5 m^3 Diesel Hydraulic Backhoe with 60 T Rear Discharge dumpers	1.265 Mm^3
2.	60 T Rear Discharge Dumpers for 4.00 km lead with Hydraulic Backhoe	0.1606 Mm3
ii)	**For Coal**	
1.	4.5 m^3 Diesel Hydraulic Backhoe with 60 T Rear Discharge dumpers	1.364 Mm^3
2.	60 T Rear Discharge Dumpers for lead range 2.50 km to 3.25 km with Hydraulic backhoe	0.2380 Mm^3 to 0.2085 Mm

B) System Capacity

Particulars	Annual Workload (Mm^3)	Annual Digging Capacity (Mm^3)	Annual Transport Capacity (Mm^3)	System Capacity (Mm^3)
Coal & 5m Top OB	1.82	2 x 1.364=2.728	8 x 0.2380=1.904	1.904
	1.52	2 x 1.265=2.530	12 x 0.1318=1.581	1.581
Total	**3.34**	**5.258**	**3.485**	**3.485**
Cushion %		57.42 %	4.34 %	4.34 %

From the above table it is clear that that the system capacity is limited by the transport capacity which is less than excavation capacity.

8.2 CALENDAR PROGRAMME OF EXCAVATION

The Calendar programme of excavation showing year-wise and cut-wise coal extraction and OB removal (Natural and programmed) is tabulated below. The calendar programme of excavation is same for all three options.

CALENDAR PROGRAMME OF EXCAVATION (ALL OPTIONS)

Year	Cut	Coal (Mt)		Natural OB (Mm3)				Programmed OB (Mm3)			
		Coal (Mt)	Cum (Mt)	Soft OB	Hard OB	Total OB	Cum (Mm3)	Soft OB	Hard OB	Total OB	Cum (Mm3)
1	Cut-IA	1.20	1.20	0.26	3.19	3.45	3.45	0.26	3.19	3.45	3.45
2	Cut-IA	1.20	2.40	0.75	3.25	4.00	7.45	0.75	3.25	4.00	7.45
3	Cut-IB	2.00	4.40	0.73	10.44	11.17	18.62	1.12	14.88	16.00	23.45
4	Cut-IB	2.50	6.90	0.91	13.05	13.96	32.58	1.12	18.88	20.00	43.45
5	Cut-IB	3.00	9.90	1.09	15.66	16.75	49.33	0.83	10.19	11.02	54.47
	Cut-II	0.00	9.90	0.00	0.00	0.00	49.33	1.74	12.24	13.98	68.45
	Sub Total	**3.00**	**9.90**	**1.09**	**15.66**	**16.75**	**49.33**	**2.57**	**22.43**	**25.00**	**68.45**
6	Cut-IB	0.92	10.82	0.34	4.80	5.14	**54.47**	0.00	0.00	0.00	68.45
	Cut-II	2.08	12.90	3.10	21.69	24.79	79.26	4.37	30.63	35.00	103.45
	Sub Total	**3.00**	**12.90**	**3.44**	**26.49**	**29.93**	**79.26**	**4.37**	**30.63**	**35.00**	**103.45**
7	Cut-II	3.00	15.90	4.47	31.29	35.76	115.02	4.62	32.38	37.00	140.45
8	Cut-II	2.70	18.60	4.02	28.17	32.19	147.21	0.86	5.90	6.76	147.21
	Cut-III	0.30	18.90	0.19	4.17	4.36	151.57	1.28	28.96	30.24	177.45
	Sub Total	**3.00**	**18.90**	**4.21**	**32.34**	**36.55**	**151.57**	**2.14**	**34.86**	**37.00**	**177.45**
9	Cut-III	3.00	21.90	1.86	41.71	43.57	195.14	1.58	35.42	37.00	214.45
10	Cut-III	3.00	24.90	1.86	41.71	43.57	238.71	1.58	35.42	37.00	251.45
11	Cut-III	2.30	27.20	1.43	31.98	33.41	272.12	0.89	19.78	20.67	272.12
	Cut-IV	0.70	27.90	0.14	7.82	7.96	280.08	0.29	16.04	16.33	288.45
	Sub Total	**3.00**	**27.90**	**1.57**	**39.80**	**41.37**	**280.08**	**1.18**	**35.82**	**37.00**	**288.45**
12	Cut-IV	3.00	30.90	0.61	33.49	34.10	314.18	0.66	36.34	37.00	325.45
13	Cut-IV	3.00	33.90	0.61	33.49	34.10	348.28	0.63	34.37	35.00	360.45
14	Cut-IV	2.19	**36.09**	0.45	24.45	24.90	373.18	0.23	12.50	12.73	**373.18**
TOTAL		**36.09**		**22.82**	**350.36**	**373.18**		**22.82**	**350.36**	**373.18**	

8.3. Rehandling of OB

The rehandling of total 6.98 Mm^3 OB (0.50 Mm^3 + 6.48 Mm^3) has been proposed by hiring agency in all the three options and the year-wise schedule of re-handling of OB is tabulated below :

Year	Rehandling of OB		
	From	To	Solid Volume (Mm3)
3	Existing Embankment	Proposed Embankment in Dip Side	0.50
12	Temp. Top Soil Dump	Top of OB Dump in New Majri Sector-IA extn. OC	6.48
TOTAL			**6.98**

In addition to above, rehandling of 0.50 Lm^3 /yr OB for blanketing of fire during extraction of developed/depillared coal pillars and 1.25 Lm^3/yr sand stowed in UG workings per annum has been considered in this report. This rehandling will be done by departmental HEMM in both departmental and partial hiring option and by out-sourcing agency in total hiring option.

8.4 DUMPING SCHEDULE

The year-wise dumping schedule is tabulated below :

DUMPING SCHEDULE

Year	Type of OB	Volume of OB (Mm3)	External Dump in New Majri UG to OC Expansion Mine			Internal Dump in New Majri Sector-IA & IIA OCM (Below GL & upto 90m ht.)	
			Temp. Top Soil Dump	Emban-kment	Externa Hard OB Dump	Sector-IA merged with Ext. Dump	Sector-IIA
1	Top Soil	0.26	0.26				
	Hard OB	3.19			3.19		
	Sub-Total	**3.45**	**0.26**		**3.19**		
2	Top Soil	0.75	0.75				
	Hard OB	3.25			3.25		
	Sub-Total	**4.00**	**0.75**		**3.25**		
3	Top Soil	1.12	1.12				
	Hard OB	14.88		4.0	10.88		
	Rehandling	0.50		0.50			
	Sub-Total	**16.50**	**1.12**	**4.50**	**10.88**		
4	Top Soil	1.12			1.12		
	Hard OB	18.88			9.31	9.57	
	Sub-Total	**20.00**			**10.43**	**9.57**	

Year	Type of OB	Volume of OB (Mm3)	External Dump in New Majri UG to OC Expansion Mine			Internal Dump in New Majri Sector-IA & IIA OCM (Below GL & upto 90m ht.)	
			Temp. Top Soil Dump	Emban-kment	Externa Hard OB Dump	Sector-IA merged with Ext. Dump	Sector-IIA
5	Top Soil	2.57			2.57		
	Hard OB	22.43				22.43	
	Sub-Total	**25.00**			**2.57**	**22.43**	
6	Top Soil	4.37			2.13	2.24	
	Hard OB	30.63				30.63	
	Sub-Total	**35.00**			**2.13**	**32.87**	
7	Top Soil	4.62				2.65	1.97
	Hard OB	32.38				10.49	21.89
	Sub-Total	**37.00**				**13.14**	**23.86**
8	Top Soil	2.14	0.01				2.13
	Hard OB	34.86				4.59	30.27
	Sub-Total	**37**	**0.01**			**4.59**	**32.40**
9	Top Soil	1.58	1.58				
	Hard OB	35.42					35.42
	Sub-Total	**37.00**	**1.58**				**35.42**
10	Top Soil	1.58	1.58				-
	Hard OB	35.42				5.00	30.42
	Sub-Total	**37**	**1.58**	**0**	**0**	**5.00**	**30.42**
11	Top Soil	1.18	1.18				
	Hard OB	35.82				20.00	15.82
	Sub-Total	**37**	**1.18**			**20.00**	**15.82**
12	Top Soil	0.66				0.66	
	Hard OB	36.34				23.86	12.48
	Rehandling		(-) 6.48			6.48	
	Sub-Total	**37.00**	**(-) 6.48**			**31.00**	**12.48**
13	Top Soil	0.63				0.63	
	Hard OB	34.37				24.53	9.84
	Sub-Total	**35.00**				**25.16**	**9.84**
14	Top Soil	0.23				0.23	
	Hard OB	12.5				**4.36**	8.14
	Sub-Total	**12.73**				**4.59**	**8.14**
TOTAL		**373.68**	**0.00**	**4.50**	**32.45**	**168.35**	**168.38**

From above table, it is clear that about **90.11 %** of total OB of proposed New Majri UG to OC Expansion mine will be accommodated in Internal dump of adjacent mine and and only 9.89% OB will be dumped in External OB dumps.

8.5 DRILLING & BLASTING

The powder factor of 3.06 m^3/kg and 5.30 t/kg has been considered for OB and coal respectively as communicated by Mine/Area. However at the time of operation of mine, drilling parameters have to be optimized on the basis of actual field trial and accordingly powder factor for OB & coal may deviate after final trial of blasting. It is further recommended that at the time of actual excavation, proper scientific study on ground vibration should be made.

9.0 QUALITY OF COAL

The quality of coal of proposed New Majri UG to OC Expansion mine is dip side expansion of existing New Majri UG to OC mine from 90m depth to 250m depth has been widely discussed in serial no. 4.6 under geology . Presently, the entire composite seam including parting is being worked in existing mine and the same will be continued in the proposed Expansion PR of the OC mine and accordingly quality of coal has been assessed in this report.

The overall quality of coal including parting and contamination due to mixing of stowed sand and OB for blanketing in the proposed PR works out to **G-11 (4115 kCal/kg).**

10.0 PUMPING & DRAINAGE

10.1 CALCULATION OF PUMPING CAPACITY

The pumping capacity required for New Majri UG to OC expansion for its life period has been assessed as under:-

Sl. No.	Descriptions	Calculated Data
1	Maximum exposed area (ha)	358.35
2	Maximum backfilled area (ha)	Nil
3	Surface area of mine considered for excavation (ha)	358.35
4	Area beyond excavation (ha),5% of item (3)	17.91

Sl. No.	Descriptions	Calculated Data
5	Run-off co-efficient for	
	Open excavation	0.70
	Area beyond excavation	0.10
6	Rainfall infiltration co-efficient for backfilled area	0.20
7	Probable max. rainfall in a day (mm)	180
8	Water collected in the quarry due to exposed area and area beyond excavation (m^3)	4,54,746
9	Required pumping capacity to handle the whole water of the rain water in 100 hrs (lps)	1264
10	Seepage due to strata (15% of Item 9)	190
11	Total pumping capacity required to handle the whole water of the mine (lps)	1453
12	Maximum Depth of mine	250

Pumping system has been designed for the entire mine life for the volume of water accumulated in the mine considering maximum rainfall in a day as **180** mm.

Peak pumping capacity worked out as **522958** cum (454746*1.15) due to maximum rainfall in a day. Above volume of water will be dewatered in 5 days at the rate of 20 hrs pumping in a day. Pumpimg capacity per day thus worked out as **104592** (522958/5) cum per day i.e. 1453 lps. The total installed pumping capacity of the working pumps proposed in the PR is **129600** cum per day i.e. (1800 lps @ 20 hrs pumping per day).

The sumps shall be made at the one end of strike in the dip side. The working benches shall be graded suitably, so that the entire water flows down to the sump.

10.2 SELECTION OF PUMPS DELIVERY RANGES

(i) Eleven pumps of 200 lps x 300 m head have been proposed. Out of eleven, two pumps are standby.

(ii) Six submersible pumps of 38 lps x 250 m head have been proposed for advanced dewatering from UG working. Out of six, one pump is standby.

(iii) One numbers of diesel pumps of 80 lps x 60 m head have been proposed.

(iv) Tweleve Face pumps of 11 lps, 30m head have been proposed. Out of twelve, two pumps are stand by.

(v) Auxiliary Pumps: Existing pumps shall be used as auxillary pumps. Details of Existing pumps are given below :

a. Face Pump – 02 Nos
b. 80 lps, 200 m Head – 02 Nos
c. 38 lps, 150m Head Submersibble Pump – 01 No
d. 38 lps, 250m Head Pump – 01 No
e. Pump model 150/200 TPB – 01 No

i) Nine delivery range of 324 mm dia. have been proposed for main pumps of 200 lps x 300m head and maximum one pump will be connected in this delivery.

ii) Five delivery range of 150 mm dia. have been proposed for submersible pumps of 38 lps x 250m head and maximum one pump will be connected in this delivery.

iii) Existing Pipes of 150 mm diameter will be used for auxiliary pumps and maximum one pump will be connected in this delivery.

iv) 80mm GI pipes will be used for Face pumps and maximum one pump will be connected in this delivery.

No piping provision has been made for standby pumps.

11.0 COAL HANDLING & DESPATCH ARRANGEMENTS

11.1 EXISTING AND PROPOSED COAL HANDLING ARRANGEMENT

Three streams of Coal Handling Plant of 400 tph capacity each exist at Majri and chargaon warfwall siding for existing New Majri UG to OC mine (1.20 Mty) and adjacent New Majri Sector – IA & IIA OC mine (2.0 Mty). Total existing capacity of CHP is 1200tph. It is proposed in this PR to enhance the target capacity of proposed New Majri UG to OC Expansion mine from 1.20 Mty to 3.0 Mty and

therefore additional crushing arrangement will be required for additional production. The proposed PR has envisaged existing annual target production of 1.20 Mty in first two years (i.e in 2018-19 & 2019-20) and production enhancement from 3rd year onwards to reach the mine target capacity of 3.0 Mty in the 5th year . However, the adjacent New Majri Sector – IA & IIA Extension OC mine has total balance life of only 5 years. There is no further scope for expansion of this mine due to Wardha river in dip side. Hence, the existing three streams of Coal Handling Plant of 400 tph capacity each (total 1200 tph capacity) at Majri and Chargaon Warfwall siding will be adequate for proposed New Majri UG to OC Expansion mine after 5 years. To meet the additional crushing requirement for three years (3rd, 4th and 5th year), two numbers of mobile crusher of 400tph capacity each are proposed to be installed at New Majri UG to OC Expansion mine on hiring / out-sourcing.

Total peak production from New Majri sector – IA & IIA Extension OC mine and New Majri UG to OC Expansion mine is approximately 4.50 Mty in 5th year and thereafter the production of 3.0 Mty will come only from proposed New Majri UG to OC Expansion mine. Total CHP capacity of 2000 tph (Existing 1200 tph + proposed mobile crushers 2 x 400tph capacity on hiring) and two wharfall siding will be sufficient for crushing and dispatch of coal for both mines in 3rd, 4th anf 5th year. After five years, New Majri sector – IA & IIA Extension OC will exhaust and existing 1200 tph capacity CHP, two wharfalll siding will be sufficient for New majri Majri UG to OC Expansion mine for rest of the mine life.

Existing three streams require strengthening and replacement of some P&M which is provided in PR. The CHP will have facilities like crushing and storage of coal on ground. The mode of dispatch of coal from New Majri UG to OC Expansion mine will be by road with the help of trucks to Majri and Chargoan siding for crushing and further dispatch by rakes.

Additional three number of electronic road weighbridge of 100t capacity will be installed at a suitable location near the CHP. This weighbridge will be used for weighing of empty and loaded trucks and for preparation of bills.

Adequate capital provision has been made in this report for strengthening and replacement of some P&M items of existing three streams. No capital provision has been made for contractual stream. In contractual stream it will be

contractor's responsibility to supply, install and operate entire system as per required condition. The details are given in Appendix – A.3.5 of this PR

12.0 WORKSHOP, STORES & MAGAZINE

12.1 DEPARTMENTAL OPTION

12.1.1 To provide maintenance and repair of various HEMM, CHP, equipment, pumps, LMVs, electrical etc of the mine, independent full fledge unit workshop has been envisaged for the project. Proposed workshop will consist of two types of maintenance and repair shops. One is excavation workshop and the other is E & M Workshop.The details are dealt in Vol-II

12.1.2 WORKSHOP AND STORES LAYOUT

For efficient operation and effective supervision, the layout of facilities in the workshop have been prepared taking into consideration the sequence of operation for maintenance & repair, minimum inter-shop movement of men & material etc..

12.1.3 WORKSHOP AND STORE PLANT & MACHINERY

The plant and machinery provided in this workshop is sufficient to meet the requirement of the scope of the workshop. Adequate P& M for main functional shops including stores have been provided. Besides that adequate provision for washing equipment, material handling equipment, floor cleaning equipment, ventilation equipment, general purpose tools, special purpose tools, installation & commissioning, electrical for workshop P & M and initial spares have been provided.

12.2 PARTIAL HIRING OPTION

12.2.1 To provide maintenance and repair of various HEMM, CHP, equipment, pumps, LMVs, electrical etc of the mine, independent full fledge unit workshop has been envisaged for the project. Proposed workshop will consist of two types of maintenance and repair shops.One is excavation workshop and the other is E & M Workshop.The details are dealt in Vol-II

12.2.2 MAINTENANCE FACILITIES

Work load, equipments, electrical load and manpower of the workshop has been assessed on the basis of population of various HEMM, CHP, equipment, pumps, LMVs, electrical etc and fulfill their running repairs and maintenance.

12.2.3 CAPITAL INVESTMENT

Total capital investment requirement has been given in appendix A.3.3 of this PR.

12.2.4 LIST OF WORKSHOP P & M

Details of shop wise P & M requirement for excavation workshop, their cost and phasing have been given in appendix A.3.3.1 and for E & M workshop in appendix A.3.3.2 of this PR.

12.3 TOTAL HIRING OPTION

12.3.1 All HEMM deployed in this mine will be hired and their maintenance will be contractor's responsibilities. Hence, there is no provision of any unit excavation workshop in the report. E & M workshop facilities have been provided to carry out the maintenance and repair of the CHP equipment, pumps, electrical etc. of the mine. This E & M workshop will be supported by Regional/Central workshop for major repairs and parts manufacture, because it is essentially a pithead maintenance workshop.

12.3.2 UNIT STORES

One small and independent unit stores has been provided at convenient location to cater the routine needs of consumables, spares, POLs etc. This will depend on Regional/Central stores for major spares. Unit store lay out drawing is not given in this project.

13.0 POWER SUPPLY, ILLUMINATION & COMMUNICATION

13.1 POWER SUPPLY

13.1.1 Source of Power (All Options)

The proposed Expansion of New Majri UG to OC mine has been planned for a production of 3 Mty. This mine lies in the Majri Area of WCL. At present, mines

of Majri area receives power from 66 kV/11kV Majri central substation. The installed capacity of this Central substation is as below :

a) 1 X 10 MVA, 66 kV/11 kV

b) 1 X 7.5 MVA, 66 kV/11 kV

c) 1 X 5 MVA, 66 kV/11 kV

The present contract demand for this substation is 6900 kVA and recorded maximum demand is 7200 kVA. The existing Majri OC is also receiving power at 11 kV from this central substation, where an 11 kV/3.3 kV, 1 MVA and 3.3 kV/ 440 V, 400 kVA transformer is installed. This substation is used for supplying power to submersible pump installed for Advance dewatering of Old Majri UG mine.

The estimated maximum demand for the proposed Majri UG to OC expansion mine will be 13358 kVA/ 7758 kVA/ 7620 kVA, for departmental / Partial Hiring / Total Hiring options. At present, the MSETCL is in process of eliminating 66 kV transmission system. MSETCL is either dismantling the 66 kV system or converting it in to 33 kV or 132 kV system. Further MSETCL is not allowing any change in contract demand of existing 66 kV system. So, it is not possible to put any additional load on the existing 66 kV/11 kV central substation. Considering this, a new 33kV/6.6 kV substation is proposed for this mine in all the options. This substation will receive power at 33 kV, through 25 KM (Approx.) long double feeder from Warora Substation of MSETCL.

The length of overhead line is not exact and may vary during implementation of project. The exact length of overhead line can be arrived after proper survey of rout (through which overhead line will cross) in consultation with MSETCL.
Thus a total amount of Rs. 10.57 crores (including GST @ 18% on total amount) has been provided in Appendix A.8.1 to meet the above cost.

13.2 PROPOSED STAGE

13.2.1 Mine Power Supply

As per the demand chart developed for the proposed New Majri UG to OC Expansion Mine, it is seen that the maximum demand of the mine (Excluding

colony) will be 13358 kVA / 7758 kVA / 7620 kVA for Departmental / Partial Hiring / Total Hiring Option.

Considering the above, it is proposed to erect a 33 kV, double feeder OH line originating from Warora MSETCL 220 kV substation to the proposed location of Expansion of New Majri UG to OCM Substation, where a 33 kV/ 6.6kV, 2 x 16 MVA, substation for Departmental Option or a 33 kV/6.6 kV, 2 x 10 MVA, substation for Partial Hiring option & Total Hiring Option is proposed to be installed which will cater the power requirement of proposed New Majri UG to OC Expansion Mine.

Connected Load, Maximum Demand

The details of connected load and Maximum Demand of the proposed Expansion of New Majri UG to OC Mine and its colony are as given below :-

Sl. No.	Item Head	Departmental Option	Partial Hiring Option	Total Hiring Option
1.	**CONNECTED LOAD**			
	a) Only Mine	26642 kW	14482 kW	14162 kW
	b) Only Colony	1857 kW	645 kW	354 kW
	c) Total	28499 kW	15127 kW	14516 kW
2.	**LOAD IN OPERATION**			
	a) Only mine	24273 kW	12113 kW	11793 kW
	b) Only township	1857 kW	645 kW	354 kW
	c) Total	26130 kW	12758 kW	12147 kW
3.	**PROJECTED MAXIMUM DEMAND**			
	a) Only mine	13358 kVA	7758 kVA	7620 kVA
	b) Only township	1364 kVA	493 kVA	271 kVA
	c) Total	14722 kVA	8251 kVA	

13.3 POWER BALANCE AND ANNUAL ENERGY CONSUMPTION

The estimated maximum demand, transformer capacity and power consumption are given in the table of Power Demand developed for the Expansion of New Majri UG to OC Mine.

Specific energy consumption for the New Majri UG to OC Expansion mine for

Departmental / Partial / Total Hiring options is 18.43 / 7.69 / 7.34 kWh/Te.

The details of capital of electrical P&M and estimated capital required is given at Appendix-A.3.2.

14.0 CIVIL CONSTRUCTION WORKS

14.1 CIVIL CONSTRUCTION

14.1.1 The Building Cost Index for the Maharashtra Region has been worked out to 617 in 2019 (I half) taking the prevalent rates of materials and labours. This Building Cost Index is with reference to base 100 in Nagpur as on 1.1.1992. The detailed calculations of Building Cost Index are shown in Appendix-A.2.3. Cost index with reference to base 100 at Delhi as on 1.10.1976 works out to 3702.

14.2 SERVICE BUILDINGS

Considering the existing service buildings available in New Majri UG to OC mine as well as additional requirement for the Expansion mine, provision for service buildings has been made as detailed below :

14.2.1 Office (All options)

Existing office infrastructure and buildings of New Majri UG to OC mine will be utilized as per the proposed mine plan.

14.2.2 Excavation Workshop

Departmental option

A workshop of 11.5 m clear height with 35 bays, open on sides, with the facility for the daily maintenance, scheduled maintenance, medium and minor repair for 60T dumpers with 25T EOT cranes

A main workshop building of 6 m height closed from sides consists of engine shop, hydraulic equipment repair shop, radiator repair shop, electrical repair shop, machine shop, tyre repair shop suitable for 10T EOT crane.

In addition to above buildings, excavation workshop consists of washing ramp for 60T & 100T dumpers, office and stores, sub-station building, concrete pavement for dumper movement, ground water reservoir of 190kl capacity,

WBM for 100t and 60t dumper parking place inside workshop, waste oil tank of 20kl capacity, fuel station, washing platform, space for future expansion, W.C, cycle and scooter shed etc., as additional provisions are envisaged as per the proposed mine plan.

Partial Hiring option

A workshop of 10 m clear height with 5 bays, open on sides, with the facility for the daily maintenance, scheduled maintenance, medium and minor repair shed for 60T dumpers with 15T EOT cranes.

A main workshop building of 6 m height closed from sides consists of engine shop, hydraulic equipment repair shop, radiator repair shop, electrical repair shop, machine shop, tyre repair shop suitable for 10T EOT crane.

In addition to above buildings, excavation workshop consists of washing ramp for 60T dumpers, office and stores, sub-station building, concrete pavement for dumper movement, ground water reservoir of 80kl capacity, WBM dumper parking place, waste oil tank of 10kl capacity, fuel station, washing platform, space for future expansion, W.C, cycle and scooter shed etc., as additional provisions are envisaged as per the proposed mine plan.

14.2.3 E & M Workshop

Departmental and Partial Hiring option

E & M workshop consisting of main workshop building, LMV repair shed, LMV washing ramp, workshop office, workshop stores, switch room, cycle and scooter shed, security post, bituminous pavement, underground water tank, pump house, washing platform and lavatories along with a boundary wall with gate has been envisaged as per the proposed mine plan.

Total Hiring option

E & M workshop consisting of main workshop building, workshop office, workshop stores, switch room, cycle and scooter shed, security post, bituminous pavement, underground water tank, pump house, washing platform and lavatories along with a boundary wall with gate has been envisaged in the report as per the proposed mine plan.

14.2.4 Estimated amount for Service Building (All options)

Details and estimated amount of the proposed service buildings are shown in appendix – A.2.1

14.3 RESIDENTIAL BUILDINGS

14.3.1 Manpower & No. of Quarters

Total manpower proposed for this project is 1535, 549 and 298 in Departmental, Partial Hiring and Total Hiring options respectively. As per the proposed mine plan, it has been assumed that the manpower requirement will be fulfilled by existing mines of Majri area, accordingly quarters for the proposed manpower of the mine will be provided from the existing townships of Majri area. As discussed with mine authorities, 9 accommodation in hostel/ guest house has been envisaged. Hence no new provision has been envisaged for Residential Buildings other than 9 no's hostel/ guest house accommodation.

14.3.2 Estimated amount for Residential Building (All options)

The details and estimated amounts of proposed residential buildings and their unit rates have been given in Appendix A.2.2 & A.2.4 respectively.

14.4 ROADS AND CULVERTS

14.4.1 Approach Roads and culverts (All options)

An approach Road of 3.0 km length of the stratum D specifications and necessary culverts has been envisaged and accordingly provision for approach road and culverts has been made in Appendix A.8.2.1.

14.4.2 Colony Roads & Culverts (All options)

As no provision of new residential buildings are envisaged for the proposed manpower of the mine, accordingly no new provision of colony roads and culverts are envisaged.

14.4.3 Haul Roads & Culverts

Departmental & Partial Hiring option

For transportation of Coal, Haul Road of 4 km length inside mine suitable for 60T dumpers with necessary culverts and drain has been envisaged and

accordingly provision has been made in Appendix A.8.2.3.

Total Hiring option

For transportation of Coal, Haul Road of 4 km length inside mine suitable for 35T dumpers with necessary culverts and drain has been envisaged and accordingly provision has been made in Appendix A.8.2.3.

14.4.4 Heavy Duty Roads & Culverts

Departmental & Partial Hiring option

For transportation of overburden, Heavy Duty Road of 4 km length on surface suitable for 100T dumpers with necessary culverts and drain has been envisaged and accordingly provision has been made in Appendix A.8.2.4.

Partial Hiring option

For transportation of overburden, Heavy Duty Road of 4 km length on surface of mine suitable for 60T dumpers with necessary culverts and drain has been envisaged and accordingly provision has been made in Appendix A.8.2.4.

Total Hiring option

For transportation of overburden, Heavy Duty Road of 4 km length on surface of mine suitable for 35T dumpers with necessary culverts and drain has been envisaged and accordingly provision has been made in Appendix A.8.2.4.

14.4.5 Service Roads & Culverts

For approaching different Service Buildings 1.0 km length long Sector Road on Stratum `C' specification with necessary culverts, and tree guards etc. has been envisaged and accordingly provision for service road & culverts has been made in Appendix A.8.2.5

14.4.6 Diversion Roads & Culverts

Diversion of road from Patala village to Majri railway station of 4.0 km long Sector Road on Stratum `C' specification with necessary culverts, drains and tree guards etc. has been envisaged and accordingly, provision for diversion road & culverts has been made in Appendix A.8.2.6

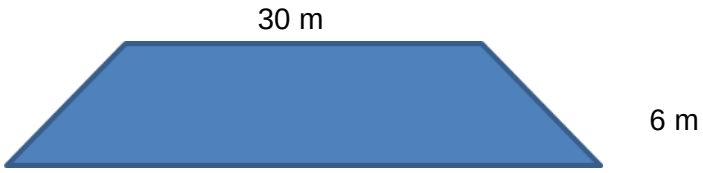
14.4.7 Estimated Amount for Roads and Culverts

The estimated amount and other details for roads and culverts are given in Appendix-A.8.2.

14.5 STONE PITCHING (All options)

Wardha River is flowing in the dip side of the proposed Expansion mine and an embankment has been provided along the periphery of the quarry for protection against the water inrush. It is proposed in this report for stone pitching of the embankment all along Wardha river. Accordingly dry stone pitching 22.5 cm thick including supply of stones and preparing surface complete on both internal/flowing surfaces embankments for proposed length and height of the embankment has been envisaged and necessary provision has been made in the PR. However proper detailed design carrying all engineering studies and investigations for stone pitching may be vetted by appropriate authority.

The cross section of the embankment as proposed in this report is shown as below and stone pitching is provided for length of 6 km on wardha river side and 3 km on other side of embankment.



14.6 RAIL OVER BRIDGE (ROB) AND RAIL UNDER BRIDGE (RUB)

It is proposed in this PR to utilize the void of adjacent New Majri Sector – IA & IIA Extension OC mine (beyond Wani-Majri Railway line) for dumping of OB of proposed New Majri UG to OC Expansion mine. For movement of dumpers across railway line, a Railway Over Bridge (ROB) for the width of 26.5m and 260m length is envisaged and cost estimate is provided in this report. However proper detailed design carrying all engineering studies and investigations for ROB may be vetted by appropriate authority.

Another alternative to cross the railway line, a rail under bridge with two spans of 8 m each for heavy dumper movement, span of 10.25 m for dozer track & drain sump and one for diversion road of span 9.5m has been detailed in Annexure. Dimensions of the RUB as envisaged in the Annexure is 40m

width, 30m length and clear height of 7m. However, the design of RUB at suitable location having proper drainage facility should be prepared after detailed design carrying all engineering studies and investigations by appropriate authority.

15.0 SAFETY AND CONSERVATION

15.1 GENERAL

The Project Report has been drawn in conformity with the prevailing statutory provisions as per Mines Act, 1952 and CMR, 2017 applicable for safety in opencast mines. However, all statutory rules, regulations, applicable laws etc. and statutory requirement related to Govt. licenses, workers compensation, Insurance, etc. shall have to be adhered to. All the regulations & schedules of Coal Mines Regulations, 2017, DGMS circulars relating to opencast mining including underground mine to opencast mine conversion, spontaneous heating in underground mine galleries, inundation, dust suppression, slope stability and its failure etc will have to be adhered to and implemented in order to maintain day to day safety precautions as per statute.

15.2 INUNDATION

Wardha river flows in the western side of the proposed New Majri UG to OC Expansion mine The HFL of Wardha River is reported to be 193.65 m as observed in 1994 in New Majri Colliery area with reference to the assumed RL of Bench Mark of the colliery. The Koradi nala with its branches and gullies passes through the eastern part of Naglone block and joins with Shirna nala further to the east. The HFL of Shirna nala is reported to be 192.45 m. The entire up-dip side of the Naglone Area i.e. the possible quarriable zone is under the HFL because of these nalas flowing through the area. The topography in this part varies between 185 m to 190 m. Since there is a danger of flood water from Wardha river as well as Koradi nala, an embankment of 30m width on top and 6m height above HFL has been proposed all along the quarry boundary to protect the mine from sudden inrush of water. Suitable alarms connected to float in Wardha river would be provided at strategic places like Time Keeper Office, Security Office, Safety Office, Manager Residence, Pit Office etc. The floats in the river would activate the alarms as soon as the water level in the river crosses the danger mark. Suitable action can then be taken to investigate the

alarm and take other suitable precautions. It is also suggested to determine withdrawal level / Danger mark, so that as water level crosses the limit, workings shall be stopped. In addition, river side patrolling would also be carried out during monsoon to caution the authority in case of any sudden rise in the river.

The rain water falling within the project area would be diverted from the quarry area by providing garland drains and shall be collected towards low lying area.

15.3 DUST SUPPRESSION

For suppression of dust, 28 kl Water Tanker with Mist spray type water sprinklers have been provided. Suppression of mine dust may be done by using package bond & dust bond, for methodology of application DGMS Circulars should be strictly adhered to.

15.4 FIRE AND SPONTANEOUS HEATING

All safety precautions should be followed to avoid fire and spontaneous heating in the mine :

15.5 SLOPE STABILITY

It is suggested that following actions may be taken to deal with slope stability problem :

i) Vulnerable area may be identified and marked on quarry plan.

ii) Observation of actual alignment of fault, its throw, joints, etc. may be recorded during the process of exploitation.

iii) Water drainage system may be properly implemented to prevent accumulation of water in cracks. Also dumps shall be levelled to prevent accumulation of water over it. Proper drainage in dumps shall be also provided to prevent erosion of toe of dump.

iv) Regular monitoring of tension cracks, horizontal and vertical movement of strata in critical area may be done.

v) Rise side slope to be reinforced if required because it has to stand through out quarry life. No dumps/surface structures to be located within 15m of quarry edge as it will act as surcharge there by destabilizing the slope.

vi) No undercutting of slopes to be done.

vii) Proper hydro-geological studies should be done and if water table is at level of slope it should be brought down by using submersible pumps to prevent hydrostatic pressure.

viii) Proper selection of site for dumping to be done. Before dumping, place of dumping should be made free from loose material. Dumping shall not be done at an angle more than angle of repose of material being dumped.

ix) After completion of dumping operations, dumps should be stabilized by growing vegetation.

x) Every person deployed by leaser of HEMM must be trained & briefed about aspects related to slope stability.

xi) Slope stability studies should be done before dumping OB in to the voids of exhausted New majri Sec IA & II A filled with water.

i) No hard OB should dumped above black cotton soil dump.

Coal Mines Regulation, 2017 provides for precautions to be taken for Spoil banks and dumps in Regulation no. 108 and Circular No. DGMS (Tech.) (S&T) Circular 2 Dhanbad, dated 20/6/2001.

15.6 PRECAUTION WHILE WORKING UNDERGROUND PILLARS

Existing New Majri UG to OC mine is conversion of old underground mine worked by Bord and Pillar method of mining. PR for New Majri UG to OC Expansion mine proposes expansion of target coal capacity from 0.80 Mty to 3.00 Mty of the existing mine. Accurate survey of UG workings should be done so that position of galleries / junctions can be easily marked on surface while working by OC method and thus, a correlation between UG working and OC mine floor is accurately established.The drilling and blasting pattern will vary depending upon the position of underground galleries.

To eliminate the danger due to falling of equipment into developed galleries, a method of controlled blasting to fill-up the galleries will have to be adopted. Provision of Diesel operated Back-hoe have been made for coal/parting benches so that whenever there is a collapse of parting and tilting of machine into

galleries, then these Hydraulic Backhoe machine can support itself on its bucket and Operator can come out of machine safely.

While extraction of pillars by OC method, precaution against coal dust explosion & Blasting in hot strata as per relevant D.G.M.S. Circulars should be strictly adhered to.

15.7 HAUL ROAD MAINTENANCE

Adequate care must be taken for proper construction and maintenance of haul road as per the existing guidelines. The gradient of haul road should not be steeper than 1 in 16.

15.8 GENERAL LIGHTING

The standards of lighting to be provided in opencast coal mines during working at different places or areas where natural light is not sufficient has to be provided as per latest provision in CMR 2017. They have to be strictly adhered to for efficient and safe working.

15.9 BLASTING

i) At the time of operation of mine, drilling parameters have to be optimized on the basis of actual field trial depending upon joint pattern, bedding plane, type of rock and local geology of the blast site.

ii) Suitable precautions would be taken as per statute before and after blasting operations. While working near infrastructure, buildings etc., controlled blasting technique has to be practiced to minimize fly-off rocks and ground vibrations and to keep them within safe limits. Provision for conducting such scientific studies has been made in this report.

15.10 SCIENTIFIC STUDIES

Following areas have been identified in the PR of proposed New Majri UG to OC Expansion mine for detailed scientific studies:

a) Slope Stability

It is proposed to carry out scientific study on slope stability of external and internal OB dumps as well as for final slope of quarry batter. Based on the

findings of scientific research the proposed slope of dumps and batter in the report may change. Slope Stability Radar for monitoring of slope stability changes in benches of quarry/dumps is also proposed in this PR.

b) Drilling & Blasting

For optimum fragmentation of rock and coal to minimize the overall cost of excavation, it is proposed in this report to engage some scientific body to carry out research for optimum drilling and blasting. Accordingly, the powder factor suggested after this study will be followed in the proposed mine.

c) Hydrogeology

Proper provision has been made in this report for scientific study to assess the hydro-geological parameters of the proposed area.

In addition to this, various other parameters like, soil testing, etc. need scientific study. Adequate capital provision has been made in this report for these miscellaneous studies also.

15.11 SAFETY ASPECTS FOR OUTSOURCING / HIRING OF HEMM

Special precaution should be taken while deploying workers of hiring/ out-sourcing agency in the mine. Before employing any labour to the mine, proper vocation training should be imparted and recommendations of recent Safety Conference should be strictly followed. Terms and conditions shall be fixed by management for deployment of labours by leaser of HEMM as well as machineries.

16.0 ENVIRONMENT MANAGEMENT

16.1 INTRODUCTION

The Project Report of New Majri UG TO OC Mine was approved by WCL Board during its 207th meeting held on 15.11.2007 on Partial Hiring Option subject to Cost Plus agreement with prospective customer.. Accordingly application for environment clearance was made to MoEF&CC and project was granted environmental clearance by vide ref no. J-11015/25/2008-IA.II (M) Dt. 18.02.2011 for 0.8 MTY within land area of 479.16 ha.

The above PR was updated in December, 2014 and based on this updated PR, WCL entered into cost plus agreement with MAHAGENCO on 09.05.2015. Subsequently the Project Report of New Majri UG to OC mine for 0.80 Mty capacity was approved by WCL board on 23rd May, 2015. Afterwards mining operations at New Majri UG TO OC Mine started on 30.10.2015. The mine achieved the targeted coal production of 0.8 MT during the year 2015 -16. Since, the mine had potential to produce more than target capacity; a Mining Plan was prepared for enhanced capacity of 1.20 Mty which was approved by WCL Board on 29.09.2016. Based on this Mining Plan, EC for 1.20 Mty capacity was obtained from MOEF vide ref no. J-11015/25/2008-IA.II (M) Dt. 13.02.2017.

As the present proposal envisage increase in production capacity from 1.20 MTPA to 3.00 MTPA (normative) and 3.75 MTPA (peak) and also increase in ML area from 479.16 ha to 706.28 ha, the proposal will require fresh environmental clearance. Accordingly Form-I application for obtaining ToR will have to be submitted to MoEF&CC.

It is proposed in this Expansion PR to utilize the void of New Majri Sector I (A) & II (A) OC for dumping of OB generated from proposed Expansion mine. New Majri Sector II (A) OC has been granted EC vide MoEF ref no J-11015/306/2008-IA.II(M) dated 19th may, 2009 which includes New Majri I (A) OC also.

The total quantity of OB to dumped in to the void within ML area of exhausted New Majri Sector I (A) & II (A) OC mine is 336.73 Mm^3. The gainful utilization of void of New Majri Sector I (A) & II (A) OC mine will minimize and reduce additional requirement of land for external dumping to the extent of about 550 Ha. The final land use plan of New Majri Sector II (A) OC will change due to dumping of OB into the void. Thus final mine closure plan of the New Majri Sector II (A) OC will need to be changed. Accordingly, the application for amendment in EC dated 19th May, 2009 will have to be submitted to MoEF&CC. The specific condition (viii) and (ix) are required to be amended as given below:

Sl. No. as per EC letter dated 19th May, 2009	EC condition	Amendment required
Specific condition (viii)	An area not less than 581.025 ha shall be brought under afforestation which include reclaimed external dump (177.90 ha), backfilled area (403.125 ha), along ML boundary, along roads & infrastructure, green belt, and area for rationalization area within the lease and within the in township by planting native species in consulation with the local DFO/Agriculture Dept. The density of trees shall be around 2500 plants per ha.	An area not less than 715.40 ha shall be brought under afforestation which include reclaimed external dump (177.90 ha), backfilled area (537.50 ha), along ML boundary, along roads & infrastructure, green belt, and area for rationalization area within the lease and within the in township by planting native species in consulation with the local DFO/Agriculture Department. The density of trees shall be around 2500 plants per ha.
Specific condition (ix)	A progressive mine closure plan shall be implemented by reclamation of quarry area of 537.50 ha of which 403.125 ha shall be backfilled and afforested by planting native plant species in consultation with the local DFO/Agriculture Department. The density of trees shall be around 2500 per ha.	A progressive mine closure plan shall be implemented by reclamation of quarry area of 537.50 ha of total 537.50 ha shall be backfilled and afforested by planting native plant species in consultation with the local DFO/Agriculture Department. The density of trees shall be around 2500 per ha.

16.2 CAPITAL PROVISION

Additional capital provision of Rs. 2.90 Crores has been made for environment protection measures for the proposed Expansion of New Majri UG to OC mine. In addition to this, provision against CER (Corporate Environmental Responsibility) has been made in this PR. The details are tabulated below :

Sl. No.	Particulars	Additional Capital (Rs. In Lakhs)
1.	Sedimentation Pond for Treatment of Mine Waste water	25.00
2.	Effluent Treatment Plant for treatment of Workshop Effluent	25.00
3.	Base Line Environment Data Generation and Scientific Studies related to Environment	15.00
4.	Installation of fixed type sprinlers for dust control (including water reservoir, Pump, Pipeline,fogging machine etc.)	70.00
5.	Plantation During First Three Years	25.00
6.	Digital Mapping for Land Use Plan	15.00
7.	Continuous Ambient Air quality Monitoring Station (CAAQMS)	75.00
8.	Sewarage treatment Plant	15.00
9.	Misc Provisions	25.00
	Sub-Total	**290.00**
10	CER (Corporate Environmnetal Responsibility)	
	Dept. Option	379.63
	Partial Hiring	299.46
	Total Hiring	233.87
	TOTAL (Including CER)	
	Dept. Option	**669.63**
	Partial Hiring Option	**589.46**
	Total Hiring option	**523.87**

In addition to the above capital provision, Rs. 6.00/t has been provided in Unit Cost of production (Appendix-'C') for revenue nature of expenditure related to environmental management.

17.0 LAND REQUIREMENT

17.1 GENERAL

In the approved PR of existing New Majri UG to OC mine (approved on 23.05.2015), provision for 479.16 ha land (460.21 ha tenancy land and 18.95 ha government land) was made. Out of 479.16 ha land, 455.77 ha land (436.82 ha tenancy land and 140.78 ha government land) has been acquired.

The proposed Expansion PR of New Majri UG to OC mine has envisaged further expansion of mine in dip side and the total land involved in this Expansion PR including the existing mine area works out to 706.28 ha (680.51 ha tenancy and 25.77 ha govt. land). The requirement of land has been worked out on the basis

of part of Khasra plan provided by Majri Area. Proposed mine boundary has been shown in quarry & surface layout plan.

17.2 LAND REQUIREMENT

The details of land already acquired as well as land proposed for acquisition in the Expansion PR of New Majri UG to OC mine are given below :

Sl. No.	Particulars	Tenancy land (ha)	Govt. Land (ha)	Forest Land (ha)	Total Land (ha)
1	Land required as per the approved PR of New Majri UG to OC mine (Dec., 2014)	460.21	18.95	Nil	479.16
2	Land already acquired up to 01.04.2018	436.82	18.95	Nil	455.77
3	Balance Land to be acquired as per approved PR (Dec. 2014) = (1 - 2)	23.39	Nil	Nil	23.39
4	Addl. Land to be acquired for Expansion of the mine	220.30	6.82	Nil	227.12
5	Total Land to be acquired in the proposed New Majri UG to OC Expansion mine = (3 + 4)	243.69	6.82	Nil	250.51
6	Total Land involved in the PR of New Majri UG to OC Expansion mine = (2 + 5)	680.51	25.77	Nil	706.28

Thus, the total land involved in proposed expansion mine is 706.28 ha, out of which 455.77 ha has already been acquired. Balance 250.51 ha land (243.69 ha tenancy land and 6.82 ha government land) will have to be acquired in proposed Expansion PR of New Majri UG to OC mine. The land required for the project belongs to surrounding villages namely Palasgaon, Naglone, Sivji Nagar and Patala.

Note : The govt and tenancy land records of the proposed mine area have not been provided by mine management and the above land details are based on the measurement of area on Revenue Plan supplied by mine / area. This may vary with the actual land measures as per the govt. land records.

17.3 REHABILITATION & RESETTLEMENT

As per the data provided by Majri Area WCL, about 40 nos.of hutments/ quarters belonging to WCL employees in WCL land and 70 nos. of private hutments in private land are required to be dismantled as these hutments fall within safety

zone of the mine. Accordingly, provision has been made in this report for above dismantling and shifting of houses.

17.4 PRESENT STATUS OF LAND ACQUISITION

In the approved PR of existing New Majri UG to OC mine (approved on 23.05.2015), provision for 479.16 ha land (460.21 ha tenancy land and 18.95 ha government land) was made. Out of 479.16 ha land, 455.77 ha land (436.82 ha tenancy land and 140.78 ha government land) has been acquired.

The breakup of existing acquired land is as follows :

Sl. No.	Type of Land already acquired	Area (ha)
1	Tenancy Land	436.82
2	Govt. land	18.95
3	Forest Land	Nil
	Total	455.77

17.5 STATUS OF FORESTRY CLEARANCE

No forest land is involved in the proposed PR.

17.6 COST OF LAND, COMPENSATION & REHABILITATION

As the new Right to Fair Compensation and Transpency in Land Acquistion, Rehabiltation & Resettlement Act has come into force, the provision for land acquisition has to be carried out as per this Act.

However, in absence of land data, the capital requirement for land has been calculated based on the rate of tenancy land @ 32.00 lakhs per hectare (Rs. 8.00 lakh per hectare x multiplying factor of 2.0 for rural area x 2 for 100% solatium). The additional tenancy land required for the proposed Expansion of New Majri UG to OC mine is 243.69 ha. In absence of data, 3 no. of adults (project affected family) per ha of tenancy land has been considered in this report and thus total no. of PAFs works out to 732 (3 x 244). Since, the choice of PAFs regarding monetary compensation, employment or annuity is not available, for economic evaluation, monetary compensation has been considered for 50% of total project affected families (50% of 732 = say 366) @ Rs. 5 Lakhs per PAF. In case employment is demanded by project affected families, the monetary compensation amount will reduce accordingly.

In addition to this, capital requirement has been worked out for Rehabilitation and Resettlement of 110 houses (40 nos of houses in WCL land & 70 nos of houses in private land) located within the proposed mine boundary.

Break up of capital provision for land acquisition & rehabilitation has been given in Appendix-A.1 of this report.

However, once survey for project affected families and other assets is carried out as per the requirement of Right to Fair Compensation and Transpency in Land Acquistion, Rehabiltation & Resettlement Act – 2013, the capital requirement may change and may be considered provided the expansion PR is economically viable.

18.0 MINE CLOSURE PLANNING

18.1 For Mine Closure activities, a corpus fund is created by opening an escrow account with the coal controller organization in nationalised bank. For opencast mine, an amount @ Rs 6.00 lakhs per Ha of the project area is required to be deposited in this account for final mine closure. Progressive mine closure is done with the fund provided in approved report. The above rate has been adopted as per Circular No. 55011-01-2009-CPAM, GOI, Ministry of Coal, dated 27 August 2009.

In this PR, the total corpus of closure cost has been worked out for 706.28 ha land and balance life of 14 years as on 01.04.2018 after making adjustment for the corpus fund already deposited in the Escrow account of existing New Majri UG to OC mine during the period from 2015-16 to 2017-18. The total amount deposited in the Escrow A/c against Mine Closure for existing New Majri UG to OC mine upto 2017-18 is tabulated below :-

Year	Amount Deposited in Escrow A/c upto 2017-18 (Rs. In Lakhs)
2015-16	228.29
2016-17	239.70
2017-18	251.69
Total	**719.68**

The 1st year of the proposed Expansion PR is 2018-19, but the revised mine closure corpus for the proposed Expansion of New Majri UG to OC mine has been assessed from 2nd year (2019-20) assuming that the annual mine closure

amount for 1st year will be deposited at the prevailing rate (Rs. 251.69 lakhs x 1.05 = Rs. 264.27 lakhs).

The detailed calculation of the corpus fund as well as annual corpus amount for the proposed New Majri UG to OC Expansion mine has been worked out and the details are tabulated below.

Sl. No.	Details	Partial Hiring
1	WPI for All Commodities for Aug 2009 (New Series)	83.02
2	WPI for All Commodities for Feb, 2019 (New Series)	119.50
3	Ratio of WPI =(2) / (1)	**1.4394122**
4	Total land area requirement for the project (ha) =	706.28
5	Mine closure cost @ Rs 6 lacs/ha (Rs in Lakhs) =	4237.68
6	Mine closure cost after indexing from Aug' 09 to Feb, 2019 (Rs. In Lakhs) = (5) x (3) =	**6099.77**
7	Amount already deposited by existing New Majri UG to OC mine up to 31.03.2018 (Rs in Lakhs)	719.68
8	Mine Closure amount to be deposited in 1st year of Expansion mine (2018-19) (Rs. In Lakhs)	264.27
9	Balance Mine Closure Corpus to be deposited from 2nd year to 14th year (Rs. In Lakhs) = (6) – (7) – (8)	5115.82
10	Net Annual Mine closure amount to be deposited in 2nd year (2019-20) of the Expansion mine (Rs. In Lakhs) = (9)*1.05/balance 13 years life	413.20

The annual Mine Closure Cost to be deposited in the proposed Expansion PR of New Majri UG to OC mine is tabulated below :

Year		Annual Production (Mty)	Corpus Fund (Rs. in Lakhs)	Mine Closure Cost (Rs /t)
1	2018-19	1.2000	264.27	22.02
2	2019-20	1.2000	413.20	34.43
3	2020-21	2.0000	433.86	21.69
4	2021-22	2.5000	455.55	18.22
5	2022-23	3.0000	478.33	15.94
6	2023-24	3.0000	502.25	16.74
7	2024-25	3.0000	527.36	17.58
8	2025-26	3.0000	553.73	18.46
9	2026-27	3.0000	581.42	19.38

10	2027-28	3.0000	610.49	20.35
11	2028-29	3.0000	641.01	21.37
12	2029-30	3.0000	673.06	22.44
13	2030-31	3.0000	706.71	23.56
14	2031-32	2.1900	742.05	33.88
Total		**36.09**	**7583.29**	**21.01**

18.2 BREAK-UP OF CLOSURE FUND FOR VARIOUS CLOSURE ACTIVITIES

1. Mining is to be carried out in a phased manner initiating afforestation / reclamation work in the mined out area of first phase while commencing mining in the 2nd phase.

2. Upto 80% of the total deposited amount including interest accrued in the ECSROW account may be released after every 5 years. The amount released should be equal to expenditure incurred on Progressive Mine closure in past 5 years or 80% whichever is less.

3. The expenditure as mentioned in the table below will be incurred during mine life as well as beyond mine life as per the mine plan. Accordingly the amount deposited in the Escrow A/c will be released after every 5 years based on the completion of below mentioned activities. However, the additional amount beyond the escrow account will be provided by the mine operator after estimating the final mine closure cost (as per the mine closure guideline).

4. The amount indicated separately under each head in the following table is indicative only and based on actual expenditure the amount may change.

Activity wise Break-up of Closure Cost

Total Corpus Fund = Rs. 7583.29 lakhs + Rs. 719.68 lakhs (upto 2017-18).
= **Rs. 8302.97 lakhs**

Sl. No.	Activity	% of Total Mine closure Cost	Amount (Rs.in Lakhs)	Remarks
A	**Dismantling of structures**			To be included in final mine closure plan.
	Service Building	0.2	16.61	
	Residential Building	2.67	221.69	
	Industrial Structures like, Workshop, Field substation, etc.	0.3	24.91	
B	**Permanent Fencing of mine void and other dangerous area**			To be included in final mine closure plan.
	Random rubble masonry of height 1.2 meter including leveling up in cement concrete 1:6:12 in mud mortar	1.5	124.54	
C	**Grading of highwall slopes**			To be included in final mine closure plan.
	Levelling and grading of highwall slopes	1.77	146.96	
D	**OB Dump Reclamation**			
	Handling/Dozing of OB Dump into mine void and preparation of Internal dump for reclamation.	88.66	7361.41	71% for progressive and 17.66% for final mine closure.
	Technical and Bio-reclamation including plantation and post care.	0.4	33.21	Equal Weightage through out the life of the mine.
E	**Landscaping**			
	Landscaping of the open space in leasehold area for improving its aesthetic and eco value.	0.3	24.91	Equal Weightage throughout the life of the mine.
F	**Plantation**			
	Plantation over cleared area obtained after dismantling.	0.5	41.51	To be included in final mine closure plan.
	Plantation around the quarry area and in safety zone.	0.2	16.61	Equal Weightage through out the life of the mine.
	Plantation over the external OB Dump	0.02	1.66	Equal Weightage through out the life of the mine.
G	**Post Closure Env Monitoring/Testing of Parameters for three years.**			For three years after mine closure
	Air Quality	0.22	18.27	
	Water Quality	0.2	16.61	
H	**Entrepreneurship development (vocational/ skill development) Training for sustainable income of affected people**.	0.26	21.59	Equal Weightage throughout the life of the mine.
I	**Miscellaneous and other mitigative measures.**	2	166.06	Equal Weightage through out the life of the mine.
J	**Post Closure Man power cost for supervision**	0.8	66.42	To be included in final mine closure plan.
TOTAL		**100%**	**8302.97**	

19.0 MANPOWER, PRODUCTIVITY AND TRAINING

19.1 MANPOWER REQUIREMENT

The manpower requirement in the proposed Expansion Project Report of New Majri UG to OC mine has been calculated on the basis of 3 shift operation for 330 days in a year. The manpower requirement for this project has been detailed in Appendix - B and B.1 of the project report. This has been summarized as follows :

Manpower Requirement

Sl. No.	Particulars	Strength (Nos.)		
		Departmental Option	Partial Hiring Option	Total Hiring Option
1.	Executives	50	43	27
2.	Non-executives:			
i)	Monthly rated staff	163	118	125
ii)	Daily rated staff	1322	388	146
3.	**Total**	**1535**	**549**	**298**

The existing manpower of New majri UG to OC as on 31.03.2018 is 427. In addition, about 243.69 ha tenancy land including the balance tenancy land is proposed to be acquired in expansion PR of New majri UG to OC mine. As per the discussion in the planning committee of WCL held on 08.03.2019, it was decided to absorb the financial impact of manpower generated due to land acquisition @ 1 job per 2 acre tenancy land in the Project Report. For total 243.69 ha tenancy land, the employment @ 1 job per 2 acre land works out to 301. The financial provision for 301 manpower has been made in this PR along with required manpower.

The requirement of manpower in all the options and its financial adustement are as follows :

Sl. No.	Particulars	Strength (Nos.)		
		Departmental Option	Partial Hiring Option	Total Hiring Option
1.	Manpower Requirement as per the Expansion PR	1535	549	298
2	Existing manpower as on 31.03.2018	427	427	427
3	Manpower Generated due to land acquisition @ 1 job per 2 acre land	301	301	301
4	Total manpower available (2+3)	728	728	728
5	Surplus (+) / Deficit (-) (4 - 1)	(-) 807	(+) 179	(+) 430

From above, it is clear that out of 301 manpower generated due to land acquisition, 122 manpower will be gainfully utilized in the mine and balance 179 manpower is surplus. The financial impact of these 179 manpower has been considered in economical evaluation of the PR in Partial Hiring option.

In Total Hiring option, total manpower requirement is 298, whereas existing manpower as on 01.04.2018 is 427 and hence the additional manpower is proposed to be shifted to other mines of WCL for gainful utilization. However the impact of all 301 manpower generated due to land acquisition has been absorbed in the PR in Total Hiring option.

19.2 PRODUCTIVITY

The annual capacity of proposed Expansion Project Report for New Majri UG to OC mine has been rated as 3.00 Mty of coal and peak OB removal of 37.00 Mm^3. The productivity calculated on the basis of only departmental manpower for all the three options including and excluding the welfare manpower are tabulated below:

Manpower Productivity

Sl. No.	Particulars	Strength	Manshift	O.M.S.(t)
A)	**Departmental Option**			
1.	Including Welfare Manpower	1535	405240	7.403
2.	Excluding Welfare Manpower	1517	400488	7.491
B)	**Partial Hiring Option**			
1.	Including Welfare Manpower	549	144936	20.699
2.	Excluding Welfare Manpower	532	140448	21.360
C)	**Total Hiring Option**			
1.	Including Welfare Manpower	298	78672	38.133
2.	Excluding Welfare Manpower	282	74448	40.297

20.0 PROJECT IMPLEMENTATION SCHEDULE

The major project implementation activities and their schedule of completion for the proposed New Majri UG to OC Expansion mine are detailed below:

SCHEDULE OF MAJOR ACTIVITIES

Sl. No.	Activities	Completion Schedule
1	Preparation of EMP and Environment Clearance for 3.0 Mty nominal capacity and 3.75 Mty peak capacity	2nd year
2	Acquisition and Physical Possession of Balance land	2nd - 3rd year
3	Procurement and Commissioning of HEMM	2nd - 5th year
4	Installation of 33 kV double feeder line	2nd year
5	Procurement, Erection and Commissioning of Electrical and Power Supply equipment	2nd -5th year
6	Procurement and Commissioning of Pumps, Pipes & Fittings.	2nd -5th year
7	Construction of infrastructural facilities like Workshop, Office, Garage, Stores etc.	2nd -3rd year
8	Construction of Service buildings	2nd -5th year
Sl. No.	**Activities**	**Completion Schedule**
9	Construction of Road, Water Supply & Sewerage	2nd -5th year

10	Construction of Railway Overbridge	2nd – 3rd year
11	Diversion of 66 kV & 11 kV Overhead line	2nd year
12	Diversion of Road	2nd -5th year
13	Construction of Haul Road	2nd -5th year
14	Out-sourcing of additional CHP requirement for 3 years through out-sourcing	3rd – 5th year
15	Construction of Sedimentation Pond, Effluent Treatment plant	2nd year
16	Base Line Data generation for Environmental Pollution Control Measures	2nd – 3rd year
17	Digital Mapping for Land Use, Continuous Ambient Air Quality Monitoring Station	2nd – 3rd year
18	Stone Pitching of Embankment	3rd Year
19	Construction of Hostel Type Accommodation	2nd -5th year
20	Manpower Training and Deployment	2nd-3rd year

21.0 FINANCIAL EVALUATION

21.1 CAPITAL INVESTMENT (DEPARTMENTAL OPTION)

21.1.1 ADDITIONAL AND EXISTING CAPITAL

The A/c headwise capital provisions for proposed Expansion of New Majri UG to OC mine with phasing are shown in Appendix-A. The summarized form of capital is given below :

Total Capital Investment

(Amt. in Rs. Lakhs)

A/c Head	Particulars	WDV (as on 01.04.2018)	Additional Capital provision	Total capital
01	Land	7814.45	11508.70	19323.15
02	Buildings	223.10	5951.55	6174.65
03	Plant & Machinery	836.88	115605.92	116442.80
04	Furniture & Fittings	0.87	50.00	50.87
05	Railway Siding	1.20	0.00	1.20
06	Vehicles	1.09	113.40	114.49
07	Prospecting & Boring	0.00	411.53	411.53
08	Mine Development	31.04	18588.83	18619.87
09	Rev. Exp. Capitalised	502.24	0.00	502.24
	Total	**9410.87**	**152229.93**	**161640.80**

The specific investment for additional capital works out to Rs. 5074.33 per tonne of annual target production and Rs.463.56/m^3 of excavation for both coal & OB.

21.1.2 BASIS OF PRICE OF P&M, CIVIL WORKS & HIRING RATE

The price of P&M has been considered based on price list supplied by CMPDI (HQ) as on May, 2018 and it has been escalated upto March, 2019. The price of civil works has been taken based on civil index 617 (Maharashtra) as in first half of year 2019 with a base of 100 in Nagpur on 1.1.1992.

21.1.3 FOREIGN CAPITAL

No foreign capital is involved in the PR.

21.1.4 ADDITIONAL CAPITAL UPTO TARGET YEAR

The additional Capital involved in the proposed PR of New Majri UG to OC Expansion mine is Rs 1522.2993 crores and capital involved upto the target year is Rs 823.8333 crores. The specific investment for the project for additional capital is Rs 5074.33/t while the specific investment for the P&M for additional capital is Rs 3853.53 /t.

21.2 OPENING OF REVENUE ACCOUNT & COMMERCIAL READINESS

The proposed PR is expansion of existing New Majri UG to OC mine which is already in revenue. Hence, the proposed Expansion PR will be in revenue from 1st year.

21.3 REPLACEMENT CAPITAL

Year wise replacement capital is indicated in cash flow statement (Appd.-D1 & E1)

21.4 SOURCES OF FINANCE: INTERNAL RESOURCES OR LOAN

For IRR calculation, 100% capital has been considered in cashflow. However, in unit cost of production (appendix-C), interest on loan capital has been loaded as notional cost considering 50% equity and 50% loan capital.

21.5 MANPOWER & OMS

The total requirement of manpower works out to 1535 giving OMS of 7.403 t. This includes provision for leave/ sickness. Details of manpower requirement and manpower analysis are given in Appendix-B and B.1.

21.6 EMS

The overall EMS works out to Rs. 3289.31 based on CIL norms. The salary & wages cost works out to Rs. 443.04/t at 100% Capacity.

21.7 METHOD OF ESTIMATION OF CAPITAL COST

a) Land

As the new Right to Fair Compensation and Transpency in Land Acquistion, Rehabiltation & Resettlement Act has come into force, the provision for land acquisition has to be carried out as per this Act.

However, in absence of land data, the capital requirement for land has been calculated based on the rate of tenancy land @ 32.00 lakhs per hectare (Rs. 8.00 lakh per hectare x multiplying factor of 2.0 for rural area x 2 for 100% solatium).

In addition to this, capital requirement has been worked out for Rehabilitation and Resettlement of 110 houses (40 nos of houses in WCL land & 70 nos of houses in private land) located within the proposed mine boundary.

However, once survey for project affected families and other assets is carried out, the capital requirement may change and may be considered provided the PR is economically viable.

b) Civil Construction (Along With Cost Index)

The details about capital cost for civil construction has been given in Appendix- A.2. The cost of civil works has been estimated on the basis of Cost Index of 617 at Maharashtra as on 1st half of the year 2019.

c) P&M

The capital provision for P&M has been estimated on the basis of standard price list of May, 2018 circulated by CMPDI, Ranchi and it has been escalated upto March, 2019. For P&M items not included in the price list, the price is collected from other sources after consultation with WCL. The detailed capital cost for P&M has been given in Appendix- A.3.

21.8 COST OF PRODUCTION AT DIFFERENT LEVEL OF PRODUCTION

a) Salaries & Wages Cost

The details of category-wise /scale-wise manpower requirement and year-wise estimated wage cost are given in appendix-B.1. The estimated salaries & wages cost works out to **Rs. 443.04/t** at 100% capacity.

b) Stores Cost

Stores cost has been estimated taking into account provision for repair & maintenance, POL, explosive, and miscellaneous stores cost. The estimated stores cost has been worked out to **Rs.1124.02 /t** at 100% capacity.

c) Power Cost

Estimated energy consumption is given in the relevant chapter for power supply. The power cost has been detailed in Chapter - XIII. The average power cost per tonne of coal production works out to **Rs. 190.94 /t** at 100% level of operation.

d) Misc. Expenditure

This cost has been estimated to cover expenditure on printing & stationary, postage, telephone, repair & maintenance of assets other than P&M, workshop debit, insurance and taxes for vehicles and other repairs and a further provision has been made for deterioration of coal stock. The miscellaneous cost per tonne of coal production works out to **Rs. 125.96 /t** at 100% level of operation.

e) Administrative Charges

The administrative charge has been communicated by WCL as Rs. 185.52/t. 10% of this administrative cost per tonne of coal production has been considered in cash flow for IRR calculation which works out to **Rs.18.55 /t** (10% of Rs. 185.52/t = Rs. 18.55/t).

However, in calculation of unit cost of production, the actual administrative cost (Rs. 185.52/t) has been adjusted for incremental production for proposed Expansion PR of New Majri UG to OC mine and adjusted administrative cost works out to Rs. 174.13/t. This cost has been considered in unit cost of production showing Rs. 155.58/t (Rs. 174.13/t – Rs. 18.55/t) as notional cost.

f) Mine Closure Cost

The corpus fund for Mine closure cost has been estimated @ Rs. 6 lakhs per ha of the total land involved as on August 2009 and the present value of corpus fund has been assessed after escalating by WPI. Accordingly annual corpus amount has been estimated for entire life with escalation @ 5% per annum. Based on this corpus amount, the mine closure cost has been assessed as **Rs 21.01 /**t at 100% capacity.

g) Depreciation

Straight line method of depreciation has been adopted and the depreciation cost works out to **Rs. 489.50 /t** at 100% capacity.

h) Hiring Charges

In initial 2 years, existing system of extraction of coal and 5m OB over coal seam by departmental HEMM and removal of rest entire OB by hiring of HEMM will be continued. Rehandling of Temporary OB dump will also be carried out by hiring / out-sourcing agency. The cost of hiring of HEMM for OB removal in initial 2 years and rehandling of OB works out to **Rs. 31.76/t** at 100% target capacity.

i) Interest on Working Capital

Interest on working capital has been calculated on the basis of 4 months operating expenditure. Interest on working capital works out to **Rs. 94.79/t** at 100% capacity. Rate of interest is taken as 14.50%.

j) Interest on Loan Capital

The total capital requirement of the project is considered in cashflow as 100% equity and therefore interest on loan capital is not considered in cashflow analysis for IRR calculation.

However, considering 50% debt and 50% equity capital, interest on loan capital @ 11.5% has been computed which works out to **Rs. 89.00/t** at 100% capacity. This cost has been shown in unit cost of production as notional cost.

k) Environment Related Cost

Rs 6.00/t of coal has been provided for environmental related revenue cost.

l) COST OF PRODUCTION

Total cost of production works out to be **Rs. 2790.15/t** and **Rs.3155.80/t** at 100% and 85% capacity respectively.

The break-up of cost of production at 100% and 85% of target capacity is tabulated below:

Sl. No.	Particulars	At 100% Capacity			At 85% Capacity
		Total Cost (Rs./t)	Variable Cost (Rs./t)	Fixed Cost (Rs./t)	Total Cost (Rs./t)
1	Salaries & Wages	443.04	0.00	443.04	521.22
2	Stores	1124.02	517.93	606.09	1230.98
3	Power	190.94	101.07	89.87	206.80
4	Env. Pollution Control	6.00	0.00	6.00	7.06
5	Misc. Expenses incl. W.D.	125.96	34.27	91.69	142.14
6	Mine Closure	21.01	0.00	21.01	24.72
7	Administrative Charges	18.55	0.00	18.55	21.82
8	Hiring of Equipment	31.76	31.76	0.00	31.76
9	Depreciation	489.50	0.00	489.50	575.88
10	Interest on Working Capital @ 14.5%	94.79	33.11	61.68	105.67
	Sub-Total	**2545.57**	**718.14**	**1827.43**	**2868.05**
11	**Notional Cost**				
11.1	Interest on Loan Capital @ 11.5%	89.00	0.00	89.00	104.71
11.1	Administrative Charges (Notional cost)	155.58	0.00	155.58	183.04
	Total Cost of production	**2790.15**	**718.14**	**2072.01**	**3155.80**

21.9 GRADE OF COAL & WEIGHTED AVERAGE SELLING PRICE

The weighted average GCV of coal is 4115 kCal/kg (G-11) and the average selling price of G-11 grade of coal for Power Sector is **Rs. 1224.75/t** including coal processing charges of Rs.87/ t for (-) 100mm size of coal and Evacuation Facility Charges of Rs. 50 /t.

- **Transportation / Loading / Sizing Charges**

Evacuation Facility Charges of Rs. 50 /t has been levied for dispatch of coal as per CIL price notification : CIL:S&M:GM(F)/Pricing 2017/1005 dated 19th December, 2017. Rs 87/t has been considered for sizing charges for coal upto (-) 100 mm size.

- **Despatch of Coal & Point of Sale**

Coal from the face would be dispatched to CHP which will be transported by trucks for onward transport to Railway siding.

21.10 PROFITABILITY (PROFIT/LOSS) AT 100% AND 85% LEVEL OF PRODUCTION

The **loss** with average sale value of coal as Rs 1224.75/t for Power Sector works out to **Rs 1565.40/t** and **Rs 1931.05/** at 100 % and 85 % of target capacity respectively.

21.11 FINANCIAL IRR

The IRR of the project works out to **Negative** at 100% and 85% of target capacity for power sector.

21.12 DESIRED SELLING PRICE

The desired selling price to yield 12% IRR at 100 % and 85% capacity works out to Rs 2425.38 /t and Rs. 2726.05**/**t respectively.

21.13 DETAILS OF FSA ENTERED ON COST-PLUS BASIS (OPTIONAL)

In Departmental option, the project is not yielding the requisite IRR at 85% capacity on notified price for power sector. The mine is already on cost plus agreement with existing customer (Mahagenco) hence fresh Fuel Supply Agreement on cost plus basis is required for the proposed PR for New Majri UG to OC Expansion mine.

21.14 COMPLETION COST

Capital expenditure has been estimated / increased for forward escalation on the phasing of initial estimated capital. The escalation rate is based on W.P.I. / Civil Index of preceding 36 months. The total completion cost including WDV has been estimated as **Rs. 1904.8193 crores.**

21.15 SENSITIVITY ANALYSIS

The Risk analysis (Sensitivity analysis) has been carried out to assess the impact on IRR, NPV of cashflow at 12% discount rate and Price to yield 12% IRR due to variation in f parameters:

The impact due to variation in above cost parameters on IRR, NPV at 12% discount rate and Price to yield 12% IRR are detailed in Appendix- C3 & C4 of this report.

21.16 CONCLUSION

In Departmental Option, the IRR of the project at 100% and 85% capacity works out to negative. The selling price to yield 12% IRR at 85% of target production works out to Rs. Rs. 2726.05/t. The difference between average notified price of coal and selling price to yield 12% IRR at 85% of target capacity is Rs. (-) 1501.30/t for Power Sector. This option may be considered for approval only if customer agrees to pay the price to yield 12% IRR at 85% of target capacity (i.e. Rs. 2726.05/t).

22.0 FINANCIAL EVALUATION

22.1 CAPITAL INVESTMENT (PARTIAL HIRING OPTION)

22.1.1 SCOPE OF WORK PROPOSED TO BE OUTSOURCED

In Partial hiring option, entire Top OB (excluding 5m OB over coal seam) and rehandling of Temp. OB dump will be carried out by hiring / out-sourcing agency throughout the mine life. The scope of work by hiring/outsourcing of HEMM shall include OB removal, loading, transportation, dumping, dozing, maintenance of haul road, levelling at dumping sites, etc. as per guidelines of the project authorities highlighted in this project report or otherwise to suit the local conditions. All statutory rules, regulations and applicable laws are to be followed including those related to government licenses, workmen compensation, service tax, insurances etc

22.2 .1 SCOPE OF WORK PROPOSED TO BE DONE DEPARTMENTALLY

In Partial Hiring option, coal extraction and removal of 5m OB above coal seam have been envisaged by Departmental HEMM. Blasting operation,

surface illumination, CHP and pumping would also be done departmentally.

22.3.1 ANNUAL WORK LOAD AND HIRING RATE FOR OUTSOURCING

The rates of Top OB removal and rehandling of OB by hiring/ outsourcing of equipment for the proposed mine have been estimated on the basis of FD approved rates of WCL which have been escalated with change in diesel rate in March, 2018 for planning purpose. Accordingly, rates for excavation for hiring/ outsourcing of HEMM is being adopted in this report for planning purpose and economic evaluation of the project. These rates may vary at the time of actual implementation. The rates include excavation, transport, drilling, dozing at face & dumps, haul road maintenance, water spraying etc. It is also suggested here that before awarding the work to hiring agency, geological structure should be further confirmed by drilling additional boreholes.The workload of outsourcing agency for Top OB removal as well as rehandling of OB alongwith outsourcing rates for planning purpose are given below:

Workload for Hiring Agency and Out-sourcing Rate (Partial Hiring)

Year	Top OB		Rehandling of OB	
	Volume (Mm^3)	Hiring Rate (Rs/m^3)	Volume (Mm3)	Hiring Rate (Rs/m^3)
1	3.31	57.81		
2	3.84	57.81		
3	15.34	94.99	0.50	64.42
4	19.18	100.74		
5	23.97	100.74		
6	33.56	111.69		
7	35.48	113.04		
8	35.48	114.40		
9	35.48	114.40		
10	35.48	115.76		
11	35.48	117.12		
12	35.48	117.12	6.48	108.12
13	33.56	117.12		
14	12.21	117.12		
Total	**357.85**		**6.98**	

22.4 CAPITAL INVESTMENT

22.4.1 ADDITIONAL AND TOTAL CAPITAL

The total estimated capital investment for the proposed PR of New Majri UG to OC Expansion mine in Partial Hiring option works out to **Rs 496.3829 crores** including **WDV of Rs 94.1087 crores**. Thus, the additional capital proposed is **Rs. 402.2742 crores**. The specific investment for additional capital works out to Rs. 1340.91/t of annual target production and Rs. 122.50/m^3 of excavation for both coal & OB.

The A/c headwise capital provisions for proposed New Majri UG to OC Expansion mine with phasing are shown in Appendix-A. The summarized form of capital is given below:

Total Capital Investment

(Amt. in Rs. Lakhs)

A/c Head	Particulars	WDV (as on 01.04.2018)	Additional Capital provision	Total capital
01	Land	7814.45	11508.70	19323.15
02	Buildings	223.10	1534.26	1757.36
03	Plant & Machinery	836.88	11599.14	12436.02
04	Furniture & Fittings	0.87	50.00	50.87
05	Railway Siding	1.20	0	1.20
06	Vehicles	1.09	96.38	97.47
07	Prospecting & Boring	0.00	411.53	411.53
08	Mine Development	31.04	15027.41	15058.45
09	Rev. Exp. Capitalised	502.24	0	502.24
	Total	**9410.87**	**40227.42**	**49638.29**

22.4.2 BASIS OF PRICE OF P&M, CIVIL WORKS & HIRING RATE

The price of P&M has been considered based on price list supplied by CMPDI (HQ) as on May, 2018 and it has been escalated upto March, 2019. The price of civil works has been taken based on civil index 617 (Maharashtra) as in 1st half of year 2019 with a base of 100 in Nagpur on 1.1.1992.

22.4.3 FOREIGN CAPITAL

No foreign capital is involved in the PR.

22.5 ADDITIONAL CAPITAL UPTO TARGET YEAR

The additional capital involved in the proposed PR of New Majri UG to OC Expansion mine is Rs. 402.2742 crores and capital involved upto the target year is Rs. 375.9581 crores. The specific investment for the project for additional capital is Rs. 1340.91/t while the specific investment for the P&M for additional capital is Rs. 386.64/t.

22.6 OPENING OF REVENUE ACCOUNT & COMMERCIAL READINESS

The proposed PR is expansion of existing New Majri UG to OC mine which is already in revenue. Hence, the proposed Expansion PR will be in revenue from 1st year.

22.7 REPLACEMENT CAPITAL

Year wise replacement capital is indicated in cash flow statement (Appd.-D1 & E1)

22.8 SOURCES OF FINANCE: INTERNAL RESOURCES OR LOAN

For IRR calculation, 100% capital has been considered in cashflow. However, in unit cost of production (appendix-C), interest on loan capital has been loaded as notional cost considering 50% equity and 50% loan capital.

22.9 MANPOWER & OMS

The total requirement of manpower works out to 549 in Partial Hiring Option giving OMS of 20.699 t. This includes provision for leave/ sickness. Details of manpower requirement and manpower analysis are given in Appendix-B and B.1.

22.10 EMS

The overall EMS works out to Rs. 3477.51 based on CIL norms. The salary & wages cost works out to Rs. 240.61/t at 100% Capacity.

22.11 METHOD OF ESTIMATION OF CAPITAL COST

a) Land

As the new Right to Fair Compensation and Transpency in Land Acquistion, Rehabiltation & Resettlement Act has come into force, the provision for land acquisition has to be carried out as per this Act.

However, in absence of land data, the capital requirement for land has been calculated based on the rate of tenancy land @ 32.00 lakhs per hectare (Rs. 8.00 lakh per hectare x multiplying factor of 2.0 for rural area x 2 for 100% solatium).

In addition to this, capital requirement has been worked out for Rehabilitation and Resettlement of 110 houses (40 nos of houses in WCL land & 70 nos of houses in private land) located within the proposed mine boundary.

However, once survey for project affected families and other assets is carried out, the capital requirement may change and may be considered provided the PR is economically viable.

b) Civil Construction (Along With Cost Index)

The details about capital cost for civil construction has been given in Appendix- A.2. The cost of civil works has been estimated on the basis of Cost Index of 617 at Maharashtra as on 1st half of the year 2019.

c) P&M

The capital provision for P&M has been estimated on the basis of standard price list of May, 2018 circulated by CMPDI, Ranchi and it has been escalated upto March, 2019. For P&M items not included in the price list, the price is collected from other sources after consultation with WCL. The detailed capital cost for P&M has been given in Appendix- A.3.

22.12 COST OF PRODUCTION AT DIFFERENT LEVEL OF PRODUCTION

a) Salaries & Wages Cost

The details of category-wise /scale-wise manpower requirement and year-wise estimated wage cost are given in appendix-B.1. The estimated salaries & wages cost works out to **Rs. 240.61/t** at 100% capacity.

b) Stores Cost

Stores cost has been estimated taking into account provision for repair & maintenance, POL, explosive, and miscellaneous stores cost. The estimated stores cost has been worked out to **Rs. 314.27/t** at 100% capacity.

c) Power Cost

Estimated energy consumption is given in the relevant chapter for power supply. The power cost has been detailed in Chapter - XIII. The average power cost per tonne of coal production works out to **Rs. 85.45 /t** at 100% level of operation.

d) Misc. Expenditure

This cost has been estimated to cover expenditure on printing & stationary, postage, telephone, repair & maintenance of assets other than P&M, workshop debit, insurance and taxes for vehicles and other repairs and a further provision has been made for deterioration of coal stock. The miscellaneous cost per tonne of coal production works out to **Rs. 25.45 /t** at 100% level of operation.

e) Administrative Charges

The administrative charge has been communicated by WCL as Rs. 185.52/t. 10% of this administrative cost per tonne of coal production has been considered in cash flow for IRR calculation which works out to **Rs.18.55 /t** (10% of Rs. 185.52/t = Rs. 18.55/t).

However, in calculation of unit cost of production, the actual administrative cost (Rs. 185.52/t) has been adjusted for incremental production for proposed Expansion PR of New Majri UG to OC mine and adjusted administrative cost works out to Rs. 174.13/t. This cost has been considered in unit cost of production showing Rs. 155.58/t (Rs. 174.13/t – Rs. 18.55/t) as notional cost.

f) Mine Closure Cost

The corpus fund for Mine closure cost has been estimated @ Rs. 6 lakhs per ha of the total land involved as on August 2009 and the present value of corpus fund has been assessed after escalating by WPI. Accordingly annual corpus amount has been estimated for entire life with escalation @ 5% per

annum. Based on this corpus amount, the mine closure cost has been assessed as **Rs 21.01 /**t at 100% capacity.

g) Depreciation

Straight line method of depreciation has been adopted and the depreciation cost works out to **Rs.131.85 /t** at 100% capacity.

h) Hiring Charges

The reomoval of Top OB (excluding 5m OB over coal seam) and rehandling of Temporary OB dump are proposed to be carried out by hiring / out-sourcing agency. The cost of hiring of HEMM for OB removal and rehandling of OB works out to **Rs. 1125.12 /t** at 100% target capacity.

i) Interest on Working Capital

Interest on working capital has been calculated on the basis of 4 months operating expenditure. Interest on working capital works out to **Rs. 88.76/t** at 100% capacity. Rate of interest is taken as 14.50%.

j) Interest on Loan Capital

The total capital requirement of the project is considered in cashflow as 100% equity and therefore interest on loan capital is not considered in cashflow analysis for IRR calculation.

However, considering 50% debt and 50% equity capital, interest on loan capital @ 11.5% has been computed which works out to **Rs. 29.00/t** at 100% capacity. This cost has been shown in unit cost of production as notional cost.

k) Environment Related Cost

Rs 6.00/t of coal has been provided for environmental related revenue cost.

l) COST OF PRODUCTION

Total cost of production works out to be **Rs 2241.65/t** and **Rs. 2389.71/t** at 100% and 85% capacity respectively. The break-up of cost of production at 100% and 85% of target capacity is tabulated below:

Sl. No.	Particulars	At 100% Capacity			At 85% Capacity
		Total Cost (Rs./t)	Variable Cost (Rs./t)	Fixed Cost (Rs./t)	Total Cost (Rs./t)
1	Salaries & Wages	240.61	0.00	240.61	283.07
2	Stores	314.27	194.03	120.24	335.49
3	Power	85.45	15.11	70.34	97.86
4	Env. Pollution Control	6.0	0.0	6.0	7.06
5	Misc. Expenses incl. W.D.	25.45	3.73	21.72	29.28
6	Mine Closure	21.01	0.00	21.01	24.72
7	Administrative Charges	18.55	0.00	18.55	21.82
8	Hiring of Equipment	1125.12	1125.12	0.00	1125.12
9	Depreciation	131.85	0.00	131.85	155.12
10	Interest on Working Capital @ 14.5%	88.76	64.67	24.09	93.01
	Sub-Total	**2057.07**	**1402.66**	**654.41**	**2172.55**
11	**Notional Cost**				
11.1	Interest on Loan Capital @ 11.5%	29.00	0.00	29.00	34.12
11.2	Administrative Charges	155.58	0.00	155.58	183.04
	Total Cost of production	**2241.65**	**1402.66**	**838.99**	**2389.71**

22.13 GRADE OF COAL & WEIGHTED AVERAGE SELLING PRICE

The weighted average GCV of coal is 4115 kCal/kg (G-11) and the average selling price of G-11 grade of coal for Power Sector is **Rs. 1224.75/t** including coal processing charges of Rs.87/ t for (-) 100mm size of coal and Evacuation Facility Charges of Rs. 50 /t.

- **Transportation / Loading / Sizing Charges**

Evacuation Facility Charges of Rs. 50 /t has been levied for dispatch of coal as per CIL price notification : CIL:S&M:GM(F)/Pricing 2017/1005 dated 19th December, 2017. Rs 87/t has been considered for sizing charges for coal upto (-) 100 mm size.

- **Despatch of Coal & Point of Sale**

Coal from the face would be dispatched to CHP which will be transported by trucks for onward transport to Railway siding.

22.14 PROFITABILITY (PROFIT/LOSS) AT 100% AND 85% LEVEL OF PRODUCTION

The **loss** with average sale value of coal as Rs 1224.75/t for Power Sector works out to Rs. **1016.90/t** and Rs. **1164.96/t** at 100 % and 85 % of target capacity respectively.

22.15 FINANCIAL IRR

The IRR of the project works out to **Negative** at 100% and 85% of target capacity for power sector.

22.16 DESIRED SELLING PRICE

The desired selling price to yield 12% IRR at 100 % and 85% capacity works out to Rs 2074.36 /t and Rs. **2213.49/t** respectively.

22.17 DETAILS OF FSA ENTERED ON COST-PLUS BASIS (OPTIONAL)

In Partial Hiring option, the project is not yielding the requisite IRR at 85% capacity on notified price for power sector. The mine is already on cost plus agreement with existing customer (Mahagenco) hence fresh Fuel Supply Agreement on cost plus basis is required for the proposed PR for Expansion of New Majri UG to OC mine.

22.18 COMPLETION COST

Capital expenditure has been estimated / increased for forward escalation on the phasing of initial estimated capital. The escalation rate is based on W.P.I. / Civil Index of preceding 36 months. The total completion cost including WDV has been estimated as **Rs. 522.5076 crores.**

22.19 SENSITIVITY ANALYSIS

The Risk analysis (Sensitivity analysis) has been carried out to assess the impact on IRR, NPV of cashflow at 12% discount rate and Price to yield 12% IRR due to variation in parameters:

The impact due to variation in above cost parameters on IRR, NPV at 12% discount rate and Price to yield 12% IRR are detailed in Appendix- C3 & C4 of this report.

22.20 CONCLUSION

In Partial Hiring Option, the IRR of the project at 100% and 85% capacity works out to negative. The desired selling price to yield 12% IRR at 85% of target production works out to Rs. **2213.49/t** . The difference between average notified price of coal and selling price to yield 12% IRR at 85% of target capacity is Rs. (-) 988.74 /t for Power Sector.

This option may be considered for approval only if customer agrees to pay the price to yield 12% IRR at 85% of target capacity (i.e. Rs. 2213.49/t). The existing New Majri UG to OC mine is being operated under cost plus agreement with Mahagenco to supply 0.68 Mty coal (85% of 0.80 Mty) and the present escalated cost plus price applicable for January to June 2019 is Rs. 2129.47/t. Hence, either existing customer (Mahagenco) and/or other eligible customer/customers will have to be identified as per the guidelines of Ministry of Coal for cost plus projects to enter cost plus agreement at the above desired selling price (Rs. 2213.49/t).

23.0 FINANCIAL EVALUATION (TOTAL HIRING OPTION)

23.1 CAPITAL INVESTMENT (PARTIAL HIRING OPTION)

23.1.1 SCOPE OF WORK PROPOSED TO BE OUTSOURCED

In Total Hiring Option, entire coal extraction and OB removal will be carried out by hiring / out-sourcing of HEMM throughout mine life. The scope of work by hiring/outsourcing of HEMM shall include coal extraction, OB removal, loading, transportation, dumping, dozing, maintenance of haul road, levelling at dumping sites, etc. as per guidelines of the project authorities highlighted in this project report or otherwise to suit the local conditions.

23.2.1 SCOPE OF WORK PROPOSED TO BE DONE DEPARTMENTALLY

In Total Hiring option, blasting operation, surface illumination, CHP, pumping and supervision would be done departmentally.

23.2.2 ANNUAL WORK LOAD AND HIRING RATE FOR OUTSOURCING

The rates of coal extraction, Top OB removal and rehandling of OB by hiring/

outsourcing of equipment for the proposed mine have been estimated on the basis of FD approved rates of WCL which have been escalated with change in diesel rate in March,2019 for planning purpose. Hiring rates of OB excluding 5 m hard cover OB above coal top, for first two years (2018-19 and 2019-2020) have been kept same as per the existing contract. The workload of outsourcing agency for coal extraction and removal of Top OB as well as rehandling of OB alongwith outsourcing rates for planning purpose are given below:

Workload for Hiring Agency and Out-sourcing Rate (Total Hiring)

Year	Coal		5 m Hard cover OB over coal seam		OB		Rehandling of OB	
	Prod. (Mt)	Hiring Rate (Rs./t)	Volume (Mm^3)	Hiring Rate (Rs./m^3)	Volume (Mm^3)	Hiring Rate (Rs./m^3)	Volume (Mm^3)	Hiring Rate (Rs./m^3)
1	1.20	46.53	0.14	84.37	3.31	57.81		
2	1.20	46.53	0.16	84.37	3.84	57.81		
3	2.00	46.53			16.00	94.99	0.50	64.42
4	2.50	46.53			20.00	100.74		
5	3.00	46.53			25.00	100.74		
6	3.00	46.53			35.00	111.69		
7	3.00	46.53			37.00	113.04		
8	3.00	49.49			37.00	114.40		
9	3.00	49.49			37.00	114.40		
10	3.00	49.49			37.00	115.76		
11	3.00	51.05			37.00	117.12		
12	3.00	51.05			37.00	117.12	6.48	108.12
13	3.00	51.05			35.00	117.12		
14	2.19	52.61			12.73	117.12		
Total	**36.09**		**0.30**		**372.88**		**6.98**	

The above rates may vary at the time of actual implementation and It is suggested here that before awarding the work to hiring agency, geological structure should be further confirmed by drilling additional boreholes.

23.3 CAPITAL INVESTMENT

23.3.1 ADDITIONAL AND TOTAL CAPITAL

The total estimated capital investment for the proposed Expansion PR of New Majri UG to OC mine in Total Hiring option works out to Rs 408.2765 crores including WDV of Rs 94.1087 crores. Thus, the additional capital proposed is Rs. 314.1678 crores. The specific investment for additional capital works out to Rs. 1047.22/t of annual target production and Rs. 96.27/m^3 of excavation for both coal & OB.

The A/c headwise capital provisions for proposed Expansion PR of New Majri UG to OC mine with phasing are shown in Appendix-A. The summarized form of capital is given below:

Total Capital Investment

(Amt. in Rs. Lakhs)

A/c Head	Particulars	WDV (as on 01.04.2018)	Additional Capital provision	Total capital
01	Land	7814.45	11508.70	19323.15
02	Buildings	223.10	595.62	818.72
03	Plant & Machinery	836.88	4250.47	5087.35
04	Furniture & Fittings	0.87	50.00	50.87
05	Railway Siding	1.20	0.00	1.20
06	Vehicles	1.09	86.98	88.07
07	Prospecting & Boring	0.00	411.53	411.53
08	Mine Development	31.04	14513.48	14544.52
09	Rev. Exp. Capitalised	502.24	0.0	502.24
	Total	**9410.87**	**31416.78**	**40827.65**

23.4.1 BASIS OF PRICE OF P&M, CIVIL WORKS & HIRING RATE

The price of P&M has been considered based on price list supplied by CMPDI (HQ) as on May, 2018 and it has been escalated upto March, 2019. The price of civil works has been taken based on civil index 617 (Maharashtra) as in 1st half of year 2019 with a base of 100 in Nagpur on 1.1.1992.

23.4.2 FOREIGN CAPITAL

No foreign capital is involved in the PR.

23.5 ADDITIONAL CAPITAL UPTO TARGET YEAR

The additional capital involved in the proposed PR of New Majri UG to OC Expansion mine is Rs. 314.1678 crores and capital involved upto the target year is same i.e. Rs. 314.1678 crores. The specific investment for the project for additional capital is Rs. 1047.22/t while the specific investment for the P&M for additional capital is Rs. 141.68/t.

23.6 OPENING OF REVENUE ACCOUNT & COMMERCIAL READINESS

The proposed PR is expansion of existing New Majri UG to OC mine which is already in revenue. Hence, the proposed Expansion PR will be in revenue from 1st year.

23.7 REPLACEMENT CAPITAL

Year wise replacement capital is indicated in cash flow statement (Appd.-D1 & E1)

22.8 SOURCES OF FINANCE: INTERNAL RESOURCES OR LOAN

For IRR calculation, 100% capital has been considered in cashflow. However, in unit cost of production (appendix-C), interest on loan capital has been loaded as notional cost considering 50% equity and 50% loan capital.

23.9 MANPOWER & OMS

The total requirement of manpower works out to 298 in Total Hiring Option

giving OMS of 38.133 t. This includes provision for leave/ sickness. Details of manpower requirement and manpower analysis are given in Appendix-B and B.1.

23.10 EMS

The overall EMS works out to Rs. 3552.12 based on CIL norms. The salary & wages cost works out to Rs. 192.87/t at 100% Capacity.

23.11 METHOD OF ESTIMATION OF CAPITAL COST

a) Land

As the new Right to Fair Compensation and Transpency in Land Acquistion, Rehabiltation & Resettlement Act has come into force, the provision for land acquisition has to be carried out as per this Act.

However, in absence of land data, the capital requirement for land has been calculated based on the rate of tenancy land @ 32.00 lakhs per hectare (Rs. 8.00 lakh per hectare x multiplying factor of 2.0 for rural area x 2 for 100% solatium). The additional tenancy land required for the proposed Expansion of New Majri UG to OC mine is 243.69 ha. In absence of data, 3 no. of adults (project affected family) per ha of tenancy land has been considered in this report and thus total no. of PAFs works out to 732 (3 x 244). Since, the choice of PAFs regarding monetary compensation, employment or annuity is not available, for economic evaluation, monetary compensation has been considered for 50% of total project affected families (50% of 732 = say 366) @ Rs. 5 Lakhs per PAF. In case employment is demanded by project affected families, the monetary compensation amount will reduce accordingly.

In addition to this, capital requirement has been worked out for Rehabilitation and Resettlement of 110 houses (40 nos of houses in WCL land & 70 nos of houses in private land) located within the proposed mine boundary. However, once survey for project affected families and other assets is carried out, the capital requirement may change and may be considered provided the PR is economically viable.

b) Civil Construction (Along With Cost Index)

The details about capital cost for civil construction has been given in Appendix- A.2. The cost of civil works has been estimated on the basis of Cost Index of 617 at Maharashtra as on 1st half of the year 2019.

c) P&M

The capital provision for P&M has been estimated on the basis of standard price list of May, 2018 circulated by CMPDI, Ranchi and it has been escalated upto March, 2019. For P&M items not included in the price list, the

price is collected from other sources after consultation with WCL. The detailed capital cost for P&M has been given in Appendix- A.3.

23.12 COST OF PRODUCTION AT DIFFERENT LEVEL OF PRODUCTION

a) Salaries & Wages Cost

The details of category-wise /scale-wise manpower requirement and year-wise estimated wage cost are given in appendix-B.1. The estimated salaries & wages cost works out to **Rs. 192.87/t** at 100% capacity.

b) Stores Cost

Stores cost has been estimated taking into account provision for repair & maintenance, POL, explosive, and miscellaneous stores cost. The estimated stores cost has been worked out to **Rs. 153.74/t** at 100% capacity.

c) Power Cost

Estimated energy consumption is given in the relevant chapter for power supply. The power cost has been detailed in Chapter - XIII. The average power cost per tonne of coal production works out to **Rs. 81.89 /t** at 100% level of operation.

d) Misc. Expenditure

This cost has been estimated to cover expenditure on printing & stationary, postage, telephone, repair & maintenance of assets other than P & M,

workshop debit, insurance and taxes for vehicles and other repairs and a further provision has been made for deterioration of coal stock. The miscellaneous cost per tonne of coal production works out to **Rs. 16.86 /t** at 100% level of operation.

e) Administrative Charges

The administrative charge has been communicated by WCL as Rs. 185.52/t. 10% of this administrative cost per tonne of coal production has been considered in cash flow for IRR calculation which works out to **Rs.18.55 /t** (10% of Rs. 185.52/t = Rs. 18.55/t).

However, in calculation of unit cost of production, the actual administrative cost (Rs. 185.52/t) has been adjusted for incremental production for proposed Expansion PR of New Majri UG to OC mine and adjusted administrative cost works out to Rs. 174.13/t. This cost has been considered in unit cost of production showing Rs. 155.58/t (Rs. 174.13/t – Rs. 18.55/t) as notional cost.

f) Mine Closure Cost

The corpus fund for Mine closure cost has been estimated @ Rs. 6 lakhs per ha of the total land involved as on August 2009 and the present value of corpus fund has been assessed after escalating by WPI. Accordingly annual corpus amount has been estimated for entire life with escalation @ 5% per annum. Based on this corpus amount, the mine closure cost has been assessed as **Rs 21.01 /**t at 100% capacity.

g) Depreciation

Straight line method of depreciation has been adopted and the depreciation cost works out to **Rs. 102.77 /t** at 100% capacity.

h) Hiring Charges

The extraction of coal, reomoval of Top OB and rehandling of Temporary OB dump are proposed to be carried out by hiring / out-sourcing agency. The cost of hiring of HEMM for coal extraction, OB removal and rehandling of OB works out to **Rs. 1228.12/t** at 100% target capacity.

i) Interest on Working Capital

Interest on working capital has been calculated on the basis of 4 months operating expenditure. Interest on working capital works out to **Rs. 83.09/t** at 100% capacity. Rate of interest is taken as 14.50%.

j) Interest on Loan Capital

The total capital requirement of the project is considered in cashflow as 100% equity and therefore interest on loan capital is not considered in cashflow analysis for IRR calculation.

However, considering 50% debt and 50% equity capital, interest on loan capital @ 11.5% has been computed which works out to **Rs. 23.00/t** at 100% capacity. This cost has been shown in unit cost of production as notional cost.

k) Environment Related Cost

Rs 6.00/t of coal has been provided for environmental related revenue cost.

l) COST OF PRODUCTION

Total cost of production works out to be **Rs 2083.48/t** and **Rs. 2197.41/t** at 100% and 85% capacity respectively.

The break-up of cost of production at 100% and 85% of target capacity is tabulated below:

Sl. No.	Particulars	At 100% Capacity			At 85% Capacity
		Total Cost (Rs./t)	Variable Cost (Rs./t)	Fixed Cost (Rs./t)	Total Cost (Rs./t)
1	Salaries & Wages	192.87	0.00	192.87	226.91
2	Stores	153.74	129.82	23.92	157.96
3	Power	81.89	12.03	69.86	94.22
4	Env. Pollution Control	6.00	0.00	6.00	7.06
5	Misc. Expenses incl. W.D.	16.86	1.63	15.23	19.55
6	Mine Closure	21.01	0.00	21.01	24.72
7	Administrative Charges	18.55	0.00	18.55	21.82
8	Hiring of Equipment	1228.12	1228.12	0.00	1228.12
9	Depreciation	102.77	0.00	102.77	120.90
10	Interest on Working Capital @ 14.5%	83.09	66.29	16.80	86.05
	Sub-Total	**1904.90**	**1437.89**	**467.01**	**1987.31**
11	**Notional Cost**				
11.1	Interest on Loan Capital @ 11.5%	23.00	0.00	23.00	27.06
11.2	Administrative Charges	155.58	0.00	155.58	183.04
	Total Cost of production	**2083.48**	**1437.89**	**645.59**	**2197.41**

23.13 GRADE OF COAL & WEIGHTED AVERAGE SELLING PRICE

The weighted average GCV of coal is 4115 kCal/kg (G-11) and the average selling price of G-11 grade of coal for Power Sector is **Rs. 1224.75/t** including coal processing charges of Rs.87/ t for (-) 100mm size of coal and Evacuation Facility Charges of Rs. 50 /t.

- **Transportation / Loading / Sizing Charges**

Evacuation Facility Charges of Rs. 50 /t has been levied for dispatch of coal as per CIL price notification : CIL:S&M:GM(F)/Pricing 2017/1005 dated 19th December, 2017. Rs 87/t has been considered for sizing charges for coal upto (-) 100 mm size.

- **Despatch of Coal & Point of Sale**

Coal from the face would be dispatched to CHP which will be transported by trucks for onward transport to Railway siding.

23.14 PROFITABILITY (PROFIT/LOSS) AT 100% AND 85% LEVEL OF PRODUCTION

The **loss** with average sale value of coal as Rs 1224.75/t for Power Sector works out to **858.73/t and Rs 972.66/t** at 100 % and 85 % of target capacity respectively.

23.15 FINANCIAL IRR

The IRR of the project works out to **Negative** at 100% and 85% of target capacity for power sector and non power sector .

23.16 DESIRED SELLING PRICE

The desired selling price to yield 12% IRR at 100 % and 85% capacity works out to Rs. 1905. 99/t and **Rs. 2010.07/t** respectively.

23.17 DETAILS OF FSA ENTERED ON COST-PLUS BASIS (OPTIONAL)

In Total Hiring option, the project is not yielding the requisite IRR at 85% capacity on notified price for power sector. The mine is already on cost plus

agreement with existing customer (Mahagenco) hence fresh Fuel Supply Agreement on cost plus basis is required for the proposed Expansion PR for New Majri UG to OC mine.

23.18 COMPLETION COST

Capital expenditure has been estimated / increased for forward escalation on the phasing of initial estimated capital. The escalation rate is based on W.P.I. / Civil Index of preceding 36 months. The total completion cost including WDV has been estimated as **Rs. 422.8117 crores.**

23.19 SENSITIVITY ANALYSIS

The Risk analysis (Sensitivity analysis) has been carried out to assess the impact on IRR, NPV of cashflow at 12% discount rate and Price to yield 12% IRR due to variation in parameters:

The impact due to variation in above cost parameters on IRR, NPV at 12% discount rate and Price to yield 12% IRR are detailed in Appendix- C3 & C4 of this report.

22.20 CONCLUSION

In Total Hiring Option, the IRR of the project at 100% and 85% capacity works out to negative. The desired selling price to yield 12% IRR at 85% of target production works out to Rs. Rs. 2010.07/t. The difference between average notified price of coal and selling price to yield 12% IRR at 85% of target capacity is Rs. (-) 785.32 /t for Power Sector.

The existing New Majri UG to OC mine is being operated in Partial Hiring option under cost plus agreement with Mahagenco to supply 0.68 Mty coal (85% of 0.80 Mty) and the present escalated cost plus price applicable for January, 2019 to June, 2019 is Rs. 2129.47/t.

Although, the price to yield 12% IRR at 85% capacity in Total hiring option (Rs. 2010.07/t) of the proposed PR for 3.00 Mty capacity is less than the present escalated cost plus price applicable for January, 2019 to June, 2019 (Rs. 2129.47/t), the total hiring option will result in non utilization of existing

machinery and manpower in New Majri UG to OC mine and hence not desirable. This option may be considered for approval only if there is scope of gainful utilization of surplus manpower and machinery at some other mines of WCL as well as customer agrees to pay the price to yield 12% IRR at 85% of target capacity (i.e. Rs. 2010.07/t) for the entire coal production.

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